DESCRIPTIVE NORMS FOR PHYSICAL ACTIVITY AND HEALTHY EATING

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ABSTRACT

While it has been long known that the behaviour of others can influence individual behaviour, norms (the views and behaviours of others) are not generally reported as strong motivators of physical activity. Using the theory of normative social behaviour as a guiding framework, the purpose of this research was to examine if descriptive norms (the perceived prevalence of others' behaviour) would be more important in predicting activity than previously suspected. A secondary purpose was to extend this examination to another health behaviour, healthy eating. Three independent studies were conducted. The first two studies examined what individuals thought motivated their physical activity (Study 1) and eating (Study 2) as well as the relationship between descriptive norms and participants' own activity behaviour and healthy eating intentions. Results revealed that, despite being rated by participants as less motivating, descriptive norms were stronger predictors of activity behaviour and healthy eating intentions than other well-established non-normative reasons. It also was found that descriptive norm perceptions about a group proposed to be high in group identity (i.e., friends) was most related to physical activity behaviour and healthy eating intentions. To extend these results, a third study manipulated normative and non-normative messages to examine effects on physical activity. Participants were grouped into one of four conditions (descriptive norm, health, appearance, and control) and received motivation-based email messages specific to their condition encouraging them to be active. It was hypothesized that participants in the descriptive norm condition would experience the greatest increase in physical activity but results did not support this hypothesis, as participants' across all conditions significantly increased total physical activity after receiving the messages. A secondary hypothesis examining the focal nature of the targeted behaviours was supported in that responses to normative messages were greatest with the most focal behaviour (using the stairs). Taken together, the results of the first two studies provide preliminary evidence to suggest that the relationships between both descriptive norms and physical activity and descriptive norms and healthy eating may be going undetected. In light of the results of the third study, however, future studies are needed.

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CHAPTER 1
GENERAL INTRODUCTION

Being physically active is associated with numerous health benefits including reduced risk of type 2 diabetes (Lynch et al., 1996), reduced risk of cardiovascular disease (Hu, Tuomilehto, Silventoinen, Barengo, & Jousilahti, 2004), and lower risk of osteoporosis (Warburton, Gledhill, & Quinney, 2001). In countries such as Canada, research has shown that most adults are aware of the health benefits of being active (Cragg, Wolfe, Griffiths, & Cameron, 2007). However, fewer than half of adult Canadians are active enough to receive health benefits (Cameron, Wolfe, & Craig, 2007).

The foregoing suggests that the problem of inactivity may not be one of a lack of knowledge, but rather one of a lack of sufficient motivation to be active. Interestingly, it has been suggested that information campaigns often lack effectiveness because they fail to consider the motivation behind the behaviour (Costanzo, Archer, Aronson, & Pettigrew, 1986). In terms of motivating factors in the activity area, individuals often report personal reasons for being active, such as to improve health or physical appearance (Courneya & Hellsten, 1998; Kilpatrick, Hebert, & Bartholomew, 2005). However, the impact of others also has been identified as a source of motivation for individual activity behaviour (Heinrich, Jokura, & Maddock, 2008; Okun et al., 2003).

Focusing on the effect of others can be supported for several reasons. First, it has been known for over a century that what others do influences individual behaviour. The early work of Triplett (social facilitation effect; 1898) and Roethlisberger and Dickson (Hawthorne effect; 1939) suggested that the presence of others can influence individual behaviour. The effect of others' behaviour on one's behaviour also can be seen in Sherif's (1936) examination of the autokinetic effect and Asch's (1952) classic line experiment. Second, it has been suggested that humans have a fundamental need to belong (Baumeister & Leary, 1995), and therefore it is only logical that the behaviour of other people will influence individuals. Third, conceptual frameworks have been identified outlining the effects of others on individual behaviour (Rimal & Real, 2005).

1.1 Influence of Others on Activity

In the activity domain, the examination of processes by which individuals are directly or indirectly influenced by others (i.e., social influence; Turner, 1991) has tended

to focus on the constructs of cohesion, social support, and subjective norms (Courneya & McAuley, 1995). In general, the predicted relationships between exercise behaviour and social support (Fraser & Spink, 2002) and group cohesion (Estabrooks & Carron, 2000) have been supported in the literature. Subjective norms, on the other hand, often emerge as weak predictors of exercise behaviour (Armitage & Connor, 2001; Trost, Owen, Bauman, Sallis, & Brown, 2002).

1.2 Undetected Nature of Norms

One possible reason for this failure to find a stronger relationship between norms and activity may be that individuals are not able to detect the effect of others on their own behaviour because they have an existing personal explanation that provides them with a plausible alternative for their behaviour (e.g., I am active because it is good for my health not because others are doing it). In essence, the individuals' own naïve internalized explanation (i.e., attributions) may preclude detection of the true cause of their behaviour (i.e., influence of others).

Support for this idea can be found in the suggestion that when individuals judge the cause of their own behaviour, they tend to place greater weight on their own introspective explanations related to their decision to conform to norms rather than on behavioural evidence of their conformity (Pronin, Berger, & Molouki, 2007). If it can be assumed that individuals internalize the reasons for their behaviour and, as such, fail to notice that what others around them are doing may be influencing their behaviour, then the effect of norms on activity could be undetected, a finding that has been reported in other areas such as energy conservation (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008).

The goal of the present research was to address the possibility that the perceived prevalence of others' behaviour (i.e., descriptive norms) may be more important in predicting individual activity behaviour than previously suspected. While a number of theories outline possible avenues through which norms can affect behaviour (e.g., deviance regulation theory, Blanton & Christie, 2003; theory of reasoned action, Ajzen & Fishbein, 1980), the theory of normative social behaviour (Rimal & Real, 2005) was chosen as the conceptual underpinning for this research as it was deemed most capable of

addressing the research questions of interest. To understand this choice, a brief synopsis of the theory is instructive.

1.3 Theory of Normative Social Behaviour

The theory of normative social behaviour (Rimal & Real, 2005) is based on the premise that what others are perceived to be doing influences individual behaviour. This theory focuses specifically on the effects of one type of social norm - descriptive norms (i.e., the perceived prevalence of others' behaviour). By way of clarity, social norms, which have been described as rules that are understood and acted upon by group members without the force of laws (Cialdini & Trost, 1998), are of different types including examples such as *subjective norms* (Ajzen & Fishbein, 1980), *social norms* (Perkins & Berkowitz, 1986), or simply *norms* (Bendor & Swistak, 2001). Rimal (2008) has stressed the importance of differentiating descriptive norms, as captured in the theory of normative social behaviour, from other types of norms and, in particular, differentiating between descriptive and injunctive norms.

Injunctive norms are conceptualized as one's perception of what others believe to be appropriate behaviour (Cialdini, Reno, & Kallgren, 1990). These injunctive norms share similarities with the subjective norms of the theory of reasoned action (Aizen & Fishbein, 1980). Rimal and Real (2005) believe both injunctive and subjective norms play a role in influencing behaviour as individuals may engage in a behaviour because they believe that others important to them expect them to do so (subjective norms) and because failure to engage in the behaviour will result in social sanctions (injunctive norms). Descriptive norms, on the other hand, refer to individuals' perceptions about the prevalence of others' behaviour (e.g., most of my friends are active).

There can be overlap between types of norms. For example, individuals often rely on cues, which could be provided through descriptive norms, to guide their perceptions of injunctive norms, and injunctive norms are suggested to moderate the relationship between descriptive norms and behaviour (Rimal & Real, 2005). Despite these relationships, however, these types are distinctly different. The current research focused solely on descriptive norms as they are the main constructs in the theory of normative social behaviour and because they have been suggested to be easier to manipulate than

injunctive norms (Rimal, Lapinski, Cook, & Real, 2005), which was an important consideration as this research involved a manipulation of norms.

In their theory of normative social behaviour, Rimal and Real (2005) suggest that descriptive norms do not act in isolation. Rather, the influence of descriptive norms on individual behaviour is suggested to occur through interactions with moderators. While Rimal and Real propose that these moderators may exert a direct influence on behaviour, their primary role is to heighten the influence that descriptive norms have on behaviour. The potential moderators proposed by Rimal and Real include injunctive norms, outcome expectations, and group identity (see Figure 1.1). A fourth moderator, ego-involvement was added to the model after the theory was initially proposed (Lapinski & Rimal, 2005).

With the exception of a study examining the effect of normative messages on behavioural intentions and self-efficacy for the practice of yoga (Rimal et al., 2005), most of the research using the theory of normative social behaviour has been done with non-activity behaviours such as alcohol consumption (Real & Rimal, 2007; Rimal, 2008; Rimal & Real, 2005) and environmental conservation (Lapinski, Rimal, DeVries, & Lee, 2007). In general, the results of these studies have supported the theory with descriptive norms positively impacting behaviour or intentions. In light of these positive findings, one wonders whether the effects hypothesized by theory also would be observed for physical activity.

1.4 Overall Purpose

The goal of the current research was to examine the relationship between descriptive norms and physical activity in two separate studies (Study 1 and Study 3). A secondary purpose was to extend the examination of the possible effects of descriptive norms to another important health behaviour – healthy eating (Study 2).

First, a correlational study was conducted to examine what students thought motivated their activity as well as to examine the possible relationship between descriptive norms and participants' own activity behaviour. This was repeated in a second study examining motivations for healthy eating and the ability of descriptive norms to predict individuals' healthy eating intentions. In accordance with the theory of normative social behaviour (Rimal & Real, 2005), one of the possible moderators identified in the theory, group identity, was also examined in these two studies.

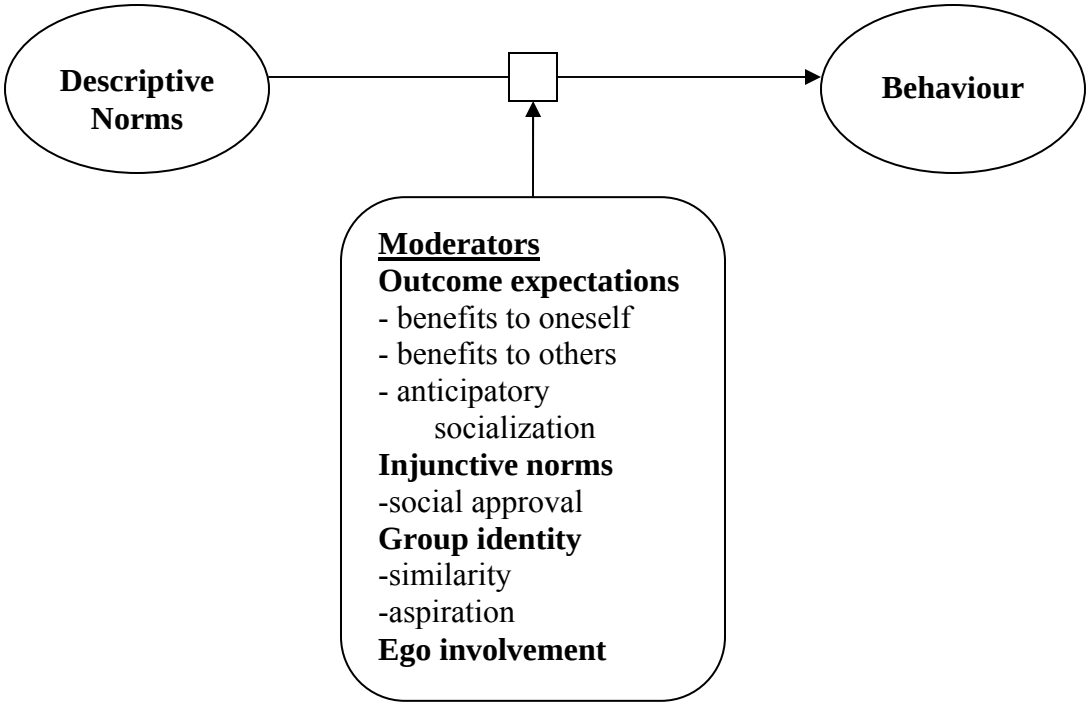

Figure 1.1 Conceptual framework: The theory of normative social behaviour including moderators of the relationship between descriptive norms and behaviour (Adapted from Rimal et al., 2005)

To extend the results from the first correlational study, a third study was conducted focusing solely on physical activity. Using an experimental design, this study examined the effects of manipulating activity messages (normative vs. non-normative) on activity behaviour. In addition to the theory of normative social behaviour, a complementary theory was utilized in the third study. The focus theory of normative conduct (Cialdini et al., 1990) suggests that norms are most effective when they capture focal behaviours (i.e., behaviours that are made salient or focused upon). In accordance with this theory, the third study considered the possibility of more and less focal target activity behaviours affecting the influence of the descriptive norm messages. Following the presentation of these three studies, a general discussion is included.

CHAPTER 2

STUDY 1: RELATIONSHIP BETWEEN DESCRIPTIVE NORMS AND PHYSICAL ACTIVITY

Descriptive studies examining the reasons for being active often reveal that individuals identify both personal (Courneya & Hellsten, 1998) and normative perceptions (Heinrich et al. 2008; Okun et al., 2003). Not surprisingly, this dual emphasis is reflected in the fact that a number of theories used in the activity area are grounded in the idea that motivated behaviours are influenced by a set of both personal and normative perceptions (e.g., theory reasoned action, Ajzen & Fishbein, 1980).

While the influence of personal factors on activity behaviour is well-documented (Cameron & Campo, 2006), norms often emerge as weaker predictors of activity behaviour (Armitage & Connor, 2001; Trost et al., 2002). This is somewhat unexpected given that the influence of normative behaviour on individuals has a long history (Asch, 1952). In Asch's classic study, participants were presented with an incorrect group judgment about visual discrimination (i.e., judging line length) that differed from their individual perception of line length. Participants tended to select the incorrect group response even though it differed from their own perceptual experience.

More recently, the effect of others on an individual's behaviour has been extended to examining descriptive norms (i.e., an individual's perceptions about the prevalence of others' behaviour, Rimal & Real, 2005). Research concerning alcohol consumption (Rimal & Real, 2007), energy conservation (Nolan et al., 2008), and sun-protection (Mahler, Kulik, Butler, Gerrard, & Gibbons, 2008) have revealed a positive relationship between norms and individual behaviour. Given these positive relationships, and their contrast to the findings that norms are weaker predictors of physical activity, further investigation seems necessary to obtain more definitive answers to help understand the mixed results (Armitage & Connor, 2001).

One reason for this failure to find a stronger relationship between norms and activity might be that the effect of descriptive norms on activity is going undetected. Researchers in the physical activity domain tend to ask individuals, "What motivates you to be active?" (Kilpatrick, Hebert, & Bartholomew, 2005), which focuses the respondent on thoughts about the motivation of norms (Armitage & Connor, 2001), rather than on

actually assessing the behavioural effects of norms. This style of elicitation may minimize the opportunity for individuals to detect the effect of others on their own behaviour because they are casting inward for an appropriate response.

Further support for the supposition that descriptive norms may be going undetected can be found in the work of Pronin and colleagues (2007). Pronin and colleagues suggest that when individuals judge the cause of their own behaviour they tend to place greater weight on their own introspective explanations related to their decision to conform to norms rather than on behavioural evidence of their conformity. Supporting this speculation, Nolan and colleagues (2008) examined the effects of normative influences on energy conservation behaviour and found participants identified personal reasons such as saving money as stronger motivators of their own energy conservation behaviour than what others around them were doing to conserve energy. Yet, it was what their neighbours were doing (descriptive norm) that was the strongest predictor of participants' energy conservation behaviour. Further, these descriptive norm perceptions predicted over and above what participants said motivated their energy conservation behaviour.

Pronin and colleagues' (2007) suggestion that individuals tend to place greater weight on introspective explanations when explaining their behaviour also seems to play out in the activity area. In general, the reasons individuals report for being active tend to be internal. For example, in a study examining the motivations of college students for being active, the reasons identified as being the most motivational included positive health, strength and endurance, appearance, and weight management (Kilpatrick et al., 2005). In this study, other people being active (i.e., descriptive norm) was not even mentioned as a motivator.

While the possibility exists that individuals simply are not influenced by others, it also is possible that they tend to underreport normative types of reasons because they are undetected. This has yet to be investigated in the activity setting. If, as suggested by Pronin, Berger, and Molouki (2007) and found by Nolan and colleagues (2008) in the energy conservation area, individuals tend to internalize the reason for their behaviour and fail to report what others around them are doing as influencing their behaviour, then the effect of norms on physical activity could be undetected.

As noted in the general introduction, a framework that may be used to examine the influence of others is the theory of normative social behaviour (Rimal & Real, 2005). This theory suggests that descriptive norms (i.e., an individual's perceptions about the prevalence of a behaviour) affect individual behaviour through interactions with potential moderators. One moderator suggested by Rimal and Real (2005) is group identity. Rimal and Real interpret group identity in terms of individuals' aspirations to imitate referent others and the extent to which they perceive similarity between themselves and those other people. This moderator works in accordance with the concepts of social cognitive theory (Bandura, 1977), which suggests that individuals are influenced by the actions of models that they aspire to become. Rimal and Real predict that the descriptive norms of a reference group that an individual wants to be like and perceives similarities with (i.e., high group identity) will have a greater influence on that individual than the norms of a group of lesser identity.

Using the theory of normative social behaviour (Rimal & Real, 2005) as the guiding conceptual framework, the goal of the present study was to address the possibility that normative influences (i.e., descriptive norms) may be more important in predicting activity behaviour than previously suspected (Heinrich et al., 2008; Okun et al., 2003). The main purpose was to examine if individuals would be aware of the relationship between descriptive norms (their perception of others' physical activity) and their own behaviour. In addition, group identity of the reference norm group was considered in the prediction of physical activity.

Three hypotheses were proposed. First, it was hypothesized that non-normative reasons (internal) would be reported by participants as stronger motivators of physical activity behaviour than a normative (external) reason. This hypothesis was based on the idea that people tend to internalize the reasons for their conforming behaviour (Pronin et al., 2007) as well as empirical research examining the motivations of college students (Kilpatrick et al., 2005).

Second, it was hypothesized that the more a participant identified with a group, the stronger the relationship between the descriptive norms of that group (i.e., the perceived activity behaviour of group members) and the participant's own activity behaviour. This hypothesis was formulated from predictions garnered from the theory of

normative social behaviour (Rimal & Real, 2005). In the current study, it was assumed that one's "friends" would be perceived as being higher in group identity than other relevant groups (e.g., students in college, other university students). Support for this speculation can be found in the results of studies examining the effect of descriptive norms on alcohol consumption. For example, Polonec, Major, and Atwood (2006) found a stronger relationship between the drinking behaviour of college students and the drinking norms of the students' friends than with the drinking norms of others in the students' college. Similarly, Campo and colleagues (2003) found that norms about a "typical student" were not related to behaviour while norms about "friends" were.

The third hypothesis was that descriptive norm perceptions about friends' physical activity would predict participants' physical activity behaviour over and above the perceived reasons (motivations) that participants reported for being active. Only the descriptive norm for friends was used to test this third hypothesis as, consistent with the second hypothesis, the norms of participants' friends group were proposed to have the greatest association with activity.

2.1 Methods

2.1.1 Participants

University students (N = 44) were recruited from a mid-sized Canadian university through classroom visits. The mean age of this sample was 21 years (*SD* = 1.9), with 89% of the participants being female (female = 39, male = 5). The mean years in university was 2.9 (*SD* = 1.3). In terms of college affiliation, 52% were Nutrition students, 36% were Arts and Science students, 9% were Agriculture students, and 2% were in Open Studies.

2.1.2 Procedures

Ethics approval was obtained for this study from the University Ethics Review Board (see Appendix A). Class instructors were approached about asking their classes for study participants. At this meeting, a time was arranged for participants to complete a survey during class time. All participants were required to complete a consent form before proceeding. The survey took approximately 10 minutes to complete and included measures of self-reported activity behaviour, ways to increase activity, perceived causal reasons (normative and non-normative) for activity, and descriptive norm perceptions

about others' activity (see Appendix B).

2.1.3 Measures

Physical Activity Behaviour. Current physical activity levels of participants were assessed using the Godin Leisure-Time Exercise Questionnaire (Godin & Shepard, 1985). This self-report measure has demonstrated acceptable reliability and validity (Godin & Shepard, 1985; Jacobs, Ainsworth, Hartman, & Leon, 1993). Consistent with the questionnaire instructions (Godin & Shepard, 1985), participants were asked about their usual weekly leisure-time physical activity in terms of strenuous, moderate, and light activities (see Appendix B; section two). As moderate and strenuous activities have been associated with health benefits (Warburton, Nicol, & Bredin, 2006), only these two intensities were included. The reported values for these two intensities were multiplied by 9 (strenuous) and 5 (moderate), and summed to obtain total weekly leisure activity levels.

Reasons for Physical Activity (Motivations). To assess participants' reasons for physical activity, three questions adapted from a measure used previously by Nolan et al. (2008) to assess motivations for energy conservation were used (see Appendix B; section four). Each question asked about a different possible reason (i.e., motivator) for activity behaviour, with two of the reasons being non-normative in nature (health and appearance) and one being normative (what others were doing). For example, the normative question read, "In deciding to or trying to be active, how important is it to you that a lot of other students are trying to be active?" Participants answered on a 7-point Likert scale (1 = *not at all important* to 7 = *very important*). The non-normative reasons used in the current study reflected commonly reported reasons university students and adults give for being physically active (Courneya & Hellsten, 1998; Kilpatrick et al., 2005). To confirm that these reasons were indeed the most important and were relevant to the sample in the current study, an open-ended question also was included, "Are there any other reasons that were not listed that strongly influence your physical activity? (If so, please list)".

Descriptive Norm Perceptions for Physical Activity. The descriptive norm questions (Appendix B; section five) assessed the participants' perceptions about the prevalence of physical activity behaviour in other relevant groups. As the conceptual definition of descriptive norms involves individual perceptions (Rimal & Real, 2005),

this was deemed an appropriate way to operationalize this construct. In addition, participants' perceptions about the prevalence of a behaviour have been used by others to capture descriptive norms (e.g., Nolan et al., 2008; Rimal, 2008). For this study, norm perceptions were asked in reference to three groups assumed to be relevant to the individual. Participants were asked their perceptions of the physical activity of their "friends", "students in college", and "other students at your university". An example of the question for friends was as follows, "How often do you think your friends try to be physically active?"(1 = *not at all* to 7 = *very much*).

These descriptive norm perception items were adapted from work by Nolan and colleagues (2008). In contrast to Nolan et al.'s study, where normative items for the three groups were collapsed into one measure, in the current study friends, which were predicted to be the group highest in group identity, were analyzed separately from the college and university student groups. The choice of friends as the group highest in identity was supported by research in the area of alcohol consumtion (Campo et al., 2003; Polonec, Major, & Atwood, 2006).

Ways to Increase Physical Activity. In an effort to inform the third study in this thesis, participants in the current study were asked how likely they would be to increase their physical activity behaviour by doing a variety of activities at or on their way to school (see Appendix B; section three). Participants were asked, "If you were going to try to increase your physical activity**,** which of these activities do you realistically think you could do to really make a change in your current activity?" and were then provided with a list of activities. One example of a listed activity was, "Taking the **stairs** instead of using the elevator or escalator when I have the chance". Participants answered from 1 (*make little change in my current activity level*) to 7 (*make lots of change in my current activity level*).

Information about gender, age, college degree program, and years at university also was collected from participants.

2.1.4 Analyses Plan

Prior to the main analyses, data were screened for outliers and variables were checked for normality. To assess the first hypothesis that non-normative reasons would be reported to be stronger motivators of physical activity behaviour than the normative

reason, a planned contrast (Furr & Rosenthal, 2003) was used to assess differences between the motivation of non-normative (health and appearance) and normative reasons for physical activity. The dependent variable was the rating of motivation of the reason while the independent variable was the type of reason (i.e., non-normative vs. normative).

The second hypothesis that descriptive norm perceptions associated with a more salient group (i.e., greater group identity) would be stronger predictors of physical activity behaviour than norms associated with less salient groups was tested using multiple regression with the predictors being the two identity norm groups – friends (greater) and combined college and university students (lesser) identity.

To test the third hypothesis that descriptive norm perceptions regarding the prevalence of friends' activity would better predict individuals' physical activity behaviour than an individual's perceived reasons for being active (i.e., motivations), a hierarchical multiple regression was used. The perceived non-normative reasons (health and appearance) were entered on step 1 while the descriptive norm perception for friends was entered on step 2.

2.2 Results

2.2.1 Descriptive Statistics

The data were screened for outliers using histograms and standardized scores. Two participants were found to be outliers and were removed from further analyses, leaving a sample of 42. Two of the reasons for being active (i.e., health and appearance) were found to be negatively skewed and transformations were done (reflection and logarithm, Tabachnick & Fidell, 2006). Results for analyses using the transformed data were not different from those using the raw data. Thus, for ease of interpretation, the results from the raw data were reported.

The students as a group were moderately active with a mean reported total weekly leisure activity level of 44. This value was equivalent to an individual participating in five bouts of strenuous or nine bouts of moderate activity (of at least 10 minutes in length) in a week, which meets the recommendations of Canada's Physical Activity Guidelines (1998) for accruing health benefits (see Table 2.1 for correlations and descriptives).

Table 2.1 Correlations and Descriptive Statistics for Activity

Variable	Mean (SD)	1	2	3	4
Non-normative reasons [a]	6.35 (.70)				
Normative reason [a]	3.05 (1.53)	-.01			
Descriptive norm perception for college/university (less group identity) [b]	4.61 (.78)	.08	.38**		
Descriptive norm perception for friends (high group identity) [b]	4.95 (1.06)	.06	.50***	.17	
Physical Activity [c]	44.2 (22.5)	.31**	.09	-.06	.40**

** $p < .05$
*** $p < .01$

[a] Scale: 1 *not at all important* to 7 *very important*
[b] Scale: 1 *not at all* to 7 *very much*
[c] Weekly leisure activity score

Responses to the questions regarding the ways of increasing physical activity provided useful information to inform the third study in this thesis. On a scale from 1 = *make little change in current activity level* to 7 = *make lots of change in my current activity level*, participants' responses to all four activities (i.e., using stairs, using the campus fitness facility, walking on breaks, and active transportation) were on the upper end of the scale (means ranged from 4.02 – 5.21 on the 7-point scale). Therefore, all four activities were considered acceptable to use in the messages for the third study of this thesis.

In addition, there were few responses to the open ended question regarding other possible reasons that strongly influenced participants' physical activity. Therefore, the non-normative reasons chosen for the current study (health and appearance) were deemed to be relevant to the population.

2.2.2 Main Analyses

As hypothesized, the planned contrast revealed that the normative reason (M = 3.05, SD = 1.55) was rated as significantly less motivating for physical activity than the average of the combined non-normative reasons (i.e., health and appearance, M = 6.35, SD = .70), $F(1, 41) = 160.69$, $p < .001$, partial eta squared = .797.

In support of the second hypothesis, normative perceptions associated with friends appeared to be the strongest predictor of physical activity. The overall model, which included descriptive norms for both friends and other college/university students, was significant, $F(2, 39) = 4.14$, $p < .05$, explaining 18% of the variance in physical activity (see Table 2.2). Examination of the beta values revealed that descriptive norm perceptions for friends (greater group identity; $\beta = .42$, $p < .01$) were stronger predictors of physical activity than descriptive norm perceptions for combined college and university students (groups lower in group identity; $\beta = -.13$, $p > .10$). Results from the semi-partial correlations revealed a similar pattern with descriptive norms for friends accounting for more unique variance in reported physical activity behaviour (sr = .33) than descriptive norms for groups lower in group identity (combined college and university students; sr = - .14).

Results from the overall model addressing the third hypothesis revealed that both reported non-normative reasons and descriptive norm perceptions for friends significantly

Table 2.2 Group Identity: Multiple Regression Results Predicting Physical Activity Behaviour

DV	Predictor	R^2	$F_{overall}$	sr^a
Activity Behaviour	Less group identity			-.14
	High group identity			.41
		.18	4.14**	

** $p < .05$

[a] *sr* – semi-partial correlation

predicted physical activity, $F(2, 39) = 6.27$, $p < .01$ (see Table 2.3). In terms of variable entry into the hierarchical regression, the reported non-normative reasons included on step 1 were significant predictors of physical activity, F change$(1, 40) = 4.38$, $p < .05$, explaining 10% of the variance in physical activity. Supporting the third hypothesis, the addition of the descriptive norms for friends on the second step was significant, F change$(1, 39) = 7.45$, $p < .01$, and increased the explained variance in physical activity to 24%. The beta values reinforce that descriptive norm perceptions for friends ($\beta = .38$, $p < .05$) were stronger predictors of physical activity than reported reasons ($\beta = .29$, $p > .10$). These results supported the third hypothesis as descriptive norm perceptions about friends' activity behaviour predicted individual physical activity over and above students' perceived reasons for being active.

As this was the first study conducted in the activity area examining normative and non-normative reasons for being active and the possible undetected nature of descriptive norms, a second study was done to replicate and extend the findings to another health behaviour, healthy eating. Healthy eating was chosen for this second study examining normative influence for two important reasons. First, in addition to physical activity, healthy eating is another important health-related behaviour that needs to be promoted in countries such as Canada. Second, the current literature on motivations for healthy eating and the influence of norms on eating behaviour appears to follow a similar pattern to that in the physical activity area (i.e., ignore normative variables as a motivation for healthy eating).

Table 2.3 Hierarchical Regression Results for Descriptive Norms Predicting Physical Activity Behaviour

DV	Step	R^2	R^2_{Δ}	F_{Δ}	$F_{overall}$
Activity Behaviour	1[a]	.10		4.38**	
	2[b]	.24	.14	7.45***	6.27***

** $p < .05$
*** $p < .01$

[a] Step 1: Reported reasons for being active
[b] Step 2: Reported reasons for being active and descriptive norms for friends

Semi-partial correlations: Reported reasons for being active (*sr* = .32)
descriptive norm for friends (*sr* = .40)

STUDY 2: RELATIONSHIP BETWEEN DESCRIPTIVE NORMS AND HEALTHY EATING

Similar to physical activity behaviour, it has been reported that despite the many recognized benefits of healthy eating (Pronk, Peek, & Goldstein, 2004), only about 50% of Canadians are meeting the recommendations of Canada's Food Guide to Healthy Eating (Paradis, Vohl, Godin, & Perusse, 2008). Further, when examining motivations and reasons for healthy eating, the reasons that emerge are similar to those reported for physical activity (i.e., internal reasons such eating for health and to improve appearance, Chang, Nitzke, Guilford, Adair, & Hazard, 2008; Shepherd et al., 2006). While there is some support for others' behaviour influencing individual eating behaviour (Herman, Roth, & Polivy, 2003), similar to physical activity behaviour, norms generally emerge as a weak predictor of healthy eating behaviour (Wood-Baker, Little, & Brownell, 2003). In light of the similar pattern regarding normative influence that is evident in both physical activity and nutrition, one wonders whether the influence of descriptive norms on healthy eating also could be undetected.

The purpose of this second study was to extend the examination of the possible undetected nature of descriptive norms to another important health behaviour – healthy eating. Individuals' awareness of the relationship between descriptive norms (their perception of others' healthy eating behaviour) and their own healthy eating intentions was assessed. In addition, group identity of the norm reference group was considered in the prediction of healthy eating intentions.

Consistent with the first study examining physical activity, three hypotheses were proposed. First, it was hypothesized that non-normative reasons (internal) would be reported by participants as stronger motivators of healthy eating intentions than a normative (external) reason (Chang et al., 2008; Shepherd et al., 2006).

Second, it was hypothesized that the more a participant identified with a group, the greater the relationship between the descriptive norms of that group (i.e., the perceived healthy eating behaviour of group members) and the participant's individual healthy eating intentions (Rimal & Real, 2005). In line with the first study, it was assumed that one's "friends" would be perceived as being higher in group identity than other relevant groups (e.g., students in college, other university students).

The third hypothesis was that descriptive norm perceptions about friends' healthy eating would be a better predictor of participants' healthy eating intentions than the perceived reasons that participants reported for trying to eat healthy (Nolan et al., 2008). Only the descriptive norm for friends was used to test this third hypothesis as, consistent with the second hypothesis, the norms of this group were proposed to be most related to intentions.

2.3 Methods

2.3.1 Participants

For this study, a sample of university students (N = 90) was recruited through visits to College of Kinesiology classrooms. The mean age of this sample of Kinesiology students was 20 years (*SD* = 1.7), with 73% of the participants being female (female = 66, male = 24). The mean years in university was 2.4 (*SD* = .92).

2.3.2 Procedures

Ethics approval was obtained for this study from the University Ethics Review Board (see Appendix A). Consistent with the first study, participants completed paper measures during class time (as arranged by the researcher with class instructors). All participants were required to complete a consent form before proceeding. The survey took approximately 10 minutes to complete and included measures of self-reported eating behaviour, healthy eating intentions, perceived causal reasons (normative and non-normative) for trying to eat healthy, and descriptive norm perceptions about others' healthy eating behaviour (see Appendix C).

2.3.3 Measures

Healthy Eating Intentions. Healthy eating intentions were chosen as the dependent variable for this study instead of behaviour as measuring overall dietary behaviour is a very tedious process, which involves multi-day Food Frequency Questionnaires or food diaries (Willet et al., 1985). Healthy eating intention, on the other hand, was simple to measure and served the purposes of this preliminary correlational research. A measure of healthy eating intentions was adapted from Strachan and Brawley (2008), who studied the association of exercise and healthy-eater identity to behaviour and intentions. As fruit and vegetable intake has been found to be important in the public's view of healthy eating (Paquette, 2005), this was used in the current study as an

indicator of overall healthy eating. Using a one-item measure, participants were asked their intentions to eat the recommended servings of fruit and vegetables on a typical day over the next two weeks (see Appendix C; section three). Participants stated their intentions to eat healthy on a 7-point Likert scale where 1 = *definitely will not* and 7 = *definitely will*.

Reasons for Healthy Eating (Motivations). To assess participants' motivations for eating healthy, similar questions to those asked in Study 1 about reasons for activity were used to examine the different possible reasons (i.e., motivators) for participants' eating behaviour. As similar reasons emerge for eating healthy as for being physically active (e.g., health and appearance; Chang et al., 2008; Shepherd et al., 2006), the questions for healthy eating included non-normative (health and appearance) reasons in addition to the normative (what others were doing) reason (see Appendix C; section four). For example, the health question read, "In deciding to or trying to eat healthy, how important is it to you that eating healthy is good for your health?" Participants answered on a 7-point Likert scale (1 = *not at all important* to 7 = *very important*). To confirm that these reasons were indeed the most important and were relevant to the sample in the current study, an open ended question also was included, "Are there any other reasons that were not listed that strongly influence your healthy eating? (If so, please list)".

Descriptive Norm Perceptions for Healthy Eating. The descriptive norm perception questions assessed the participants' perceptions about the prevalence of healthy eating in relevant groups (see Appendix C; section five). The same three groups that were thought to be relevant to the student population in Study 1 were used in the current study. Participants were asked about the eating behaviour of their "friends", "students in your college", and "other students at your university". For example, the question assessing the descriptive norm for those in the same college was as follows, "How often do you think other students in your college try to eat healthy?" (1 = *not at all*, 7 = *very much*). Consistent with Study 1, the items for the three different groups were not collapsed. Instead, friends, which were predicted to be the highest in group identity, were analyzed separately from the college and university student groups.

Healthy Eating Behaviour. The All-Day Fruit and Vegetable Scan was used as an indicator of healthy eating for demographic purposes (see Appendix C; section two). This

assessment tool has been shown to be useful among those with relatively infrequent fruit and vegetable consumption (Thompson et al., 2002), which makes it applicable to a university student population (Lowry et al., 2000).

In addition to information about fruit and vegetable consumption, participants also were asked to provide their gender, age, college, and years at the university.

2.3.4 Analyses Plan

The analyses used in this study were the same as those used in Study 1 (i.e., a planned contrast to assess the first hypothesis, multiple regression to assess the second hypothesis, and hierarchical multiple regression to assess the third hypothesis). In the current study healthy eating intentions replaced the Study 1 dependent variable of physical activity behaviour.

2.4 Results

2.4.1 Descriptive Statistics

Prior to conducting the main analysis, data were screened for outliers using histograms and standardized scores as well as checked for normality. Results revealed no outliers and variable distributions were normal. As such, the sample for the analyses remained at 90.

The descriptive data regarding the eating behaviours of the university students revealed that 38% of the students were meeting the recommendations of Canada's Food Guide (2007) regarding fruit and vegetable consumption. This is fairly representative, if not slightly less, than what is typically found in the general Canadian population (Paradis et al., 2008; see Table 2.4 for descriptives and correlations). As there were few responses to the open-ended question regarding other possible reasons that strongly influenced participants' healthy eating, the reasons chosen for the current study were deemed to be appropriate for this population.

2.4.2 Main Analyses

The planned contrast results for the first hypothesis revealed that the normative reason ($M = 3.97$, $SD = 1.60$) was rated as significantly less motivating for healthy eating than the average of the combined non-normative reasons (i.e., health and appearance, $M = 6.13$, $SD = .78$), $F(1, 89) = 176.53$, $p < .001$, partial eta squared = .665. This result is

Table 2.4 Correlations and Descriptive Statistics for Healthy Eating

Variable	Mean (SD)	1	2	3	4
Non-normative reasons [a]	6.13 (.78)				
Normative reason [a]	3.97 (1.60)	.32***			
Descriptive norm perception for college/university (less group identity)[b]	4.78 (.99)	.32***	.08		
Descriptive norm perception for friends (high group identity) [b]	4.58 (.90)	.15*	.45***	.53***	
Healthy Eating Intentions [c]	5.24 (1.28)	.13	.33***	.17*	.24**

* $p < .10$
** $p < .05$
*** $p < .01$

[a] Scale: 1 *not at all important* to 7 *very important*
[b] Scale: 1 *not at all* to 7 *very much*
[c] Scale: 1 *definitely will not* to 7 *definitely will*

consistent with the first hypothesis as well as with the results for physical activity in Study 1.

Due to the exploratory nature of this research, a significant alpha cut-off of .10 was used to avoid type two error. Using this cut off, results from the regression for the second hypothesis were significant in predicting healthy eating intentions (i.e., intentions to eat fruit and vegetables). The overall model predicting healthy eating intentions was marginally significant, $F(2, 87) = 2.75$, $p < .10$, explaining 6% of the variance in healthy eating intentions (see Table 2.5). In support of the second hypothesis and consistent with the results of Study 1 in activity, the beta values revealed that descriptive norm perceptions for friends (greater group identity; $\beta = .20$, $p < .10$) were stronger predictors of healthy eating intentions than descriptive norm perceptions for combined college and university students (groups lower in group identity; $\beta = .06$, $p > .10$). Results from the semi-partial correlations revealed a similar pattern with descriptive norms for friends accounting for more unique variance in reported healthy eating intentions ($sr = .17$) than descriptive norms for groups lower in group identity ($sr = .06$).

In terms of the third hypothesis, results from the overall regression model including both non-normative reported reasons for healthy eating and descriptive norm perceptions for friends was marginally significant in predicting healthy eating intentions, $F(2, 87) = 3.02$, $p < .06$, explaining 7% of the variance in intentions (see Table 2.6). In terms of variable entry into the hierarchical regression, the reported non-normative reasons included on step 1 were not significant predictors of intentions, F change$(1, 88) = 1.42$, $p > .10$. Supporting the third hypothesis, the addition of the descriptive norms for friends on the second step was significant, F change$(1, 87) = 4.55$, $p < .05$, increasing the explained variance in healthy eating intentions from 2% to 7%. The beta values support that descriptive norm perceptions for friends ($\beta = .22$, $p < .05$) were stronger predictors of healthy eating intentions than reported reasons for eating healthy ($\beta = .09$, $p > .10$). While the explained variance was not as high, this result is consistent with the results for physical activity behaviour in Study 1.

2.5 Discussion

Using the theory of normative social behavior as a guiding framework, the primary purpose of these two studies was to assess whether individuals would be aware

Table 2.5 Group Identity: Multiple Regression Results Predicting Healthy Eating Intentions to Eat Fruit and Vegetables

DV	Predictor	R^2	$F_{overall}$	sr^a
Healthy Eating Intentions	Less group identity			.06
	High group identity			.17
		.06	2.75*	

* $p < .10$

[a] *sr* – semi-partial correlation

Table 2.6 Hierarchical Regression Results for Descriptive Norms Predicting Healthy Eating Intentions to Eat Fruit and Vegetables

DV	Step	R^2	R^2_{Δ}	F_{Δ}	$F_{overall}$
Healthy Eating Intentions	1[a]	.02		1.42	
	2[b]	.07	.05	4.55**	3.02*

* $p < .10$
** $p < .05$

[a] Step 1: Reported reasons for eating healthy
[b] Step 2: Reported reasons for eating healthy and descriptive norm for friends

Semi-partial correlations: Reported reasons for eating healthy (*sr* = .10)
descriptive norm for friends (*sr* = .22)

of the relationship between descriptive norms for two different health behaviours and their own behaviours. The results from both studies suggested that individuals may not have been aware that descriptive norms (their perceptions about others' activity and healthy eating behaviour) were associated with their own reported activity behaviour and healthy eating intentions.

Results from each study supported the hypothesis that non-normative reasons would be reported by participants as significantly stronger motivators of physical activity and healthy eating than a normative reason (i.e., other people being active or eating healthy). The fact that non-normative reasons such as health and appearance were rated as the strongest motivators may not be surprising given that these are typically reported in literature as the top reasons for being active (Courneya & Hellsten, 1998; Kilpatrick et al., 2005) or eating healthy (Chang et al., 2008; Shepherd et al., 2006). These results also are consistent with Pronin and colleagues' (2007) suggestion that individuals are more inclined to provide introspective (i.e., personal) reasons to explain motivation for their conforming behaviour than external (i.e., normative) reasons.

As results from the third hypothesis revealed, these personal reasons may not always explain intentions and behaviour and, in some cases may disguise the true predictors of behaviour (e.g., normative reasons). What a participant thought others were doing (i.e., descriptive norms) predicted participants' healthy eating intentions and activity behaviour in spite of the fact that descriptive norms were rated by participants as less motivating than non-normative reasons. Specifically, results revealed that descriptive norm perceptions about the behaviour of relevant others increased the predicted variance in participants' own behaviour from 12% to 24% for physical activity in Study 1 and from 2% to 7% for fruit and vegetable intentions in Study 2.

A possible explanation for the finding that norms predicted more variance in physical activity behaviour than healthy eating intentions may be found in Cialdini's (2003) suggestion that descriptive norms might affect behaviour without necessarily affecting intentions. This could be because it takes relatively little cognitive thought to copy the behaviour of another. For this reason, the descriptive norms in these studies may have affected the behaviour of physical activity to a greater extent than they affected intentions for healthy eating. This is, however, simply post-hoc speculation. Of course, it

is also possible that norms affect the behaviours of physical activity and healthy eating differently, which is an area that requires future research.

Even though less variance was explained for healthy eating intentions than activity behaviour, the findings of both studies support the suggestion that, while possibly going undetected as motivators, descriptive norms appear to be important in predicting individual behaviour and intentions. This finding is consistent with results in other areas. Nolan and colleagues (2008) examined the effect of descriptive norms on energy conservation behaviour and found that while participants did not rate descriptive norms as being strong motivators of their behaviour, descriptive norm beliefs about their neighbors' energy conservation behaviour predicted participants' own energy conservation over and above the participants' reported motivations.

In addition to supporting the possibility that the relationship between norms and behaviour could be undetected, the results of the current studies also revealed that group identity may have correlated with or concurrently shared part of the relationship between descriptive norms and participant behaviour and intentions. Specifically, participants' physical activity behaviour and healthy eating intentions were most strongly predicted by the behaviour of their friends (high in group identity) versus a group proposed to hold less group identity. This finding is consistent with other research in the normative area (Campo et al., 2003; Polonec et al., 2006; Rimal, 2008). The emergence of group identity as important is also consistent with the tenets of the theory of normative social behaviour, which highlights group identity as a potential moderator in the relationship between descriptive norms and behaviour (Rimal & Real, 2005). In light of the preliminary findings in the current studies, future research properly testing group identity as a moderator of the relationships between descriptive norms and activity and descriptive norms and eating behaviour is warranted.

The current research also provides preliminary evidence illustrating why physical activity and nutrition researchers and practitioners may need to be careful when asking individuals about their motivations for physical activity and eating. As found in the current studies, descriptive norms were not reported as being very motivational when compared to other commonly-reported reasons for these health behaviours. These descriptive norms, however, were able to predict physical activity behaviour and healthy

eating intentions over and above the participants' reported reasons. While the design of Studies 1 and 2 preclude causal inferences and there is a need for experimental research, the results suggest that by simply asking individuals what motivates them to be active or eat healthy, researchers and practitioners may be missing out on factors that could influence behaviour. Further, if individuals are truly underreporting the effect of norms on their behaviour, this may provide a possible reason why norms have not tended to play out in the physical activity and nutrition literature as strongly as other social influences.

While the results of these two studies are interesting, they are not without limitations. The first limitation concerns the fact that group identity was assumed rather than tested directly. Based on the literature, it was predicted that friends would be the group highest in group identity (Campo et al., 2003; Polonec et al., 2006). This seemed to be the case as the descriptive norms of this group had the greatest association with participants' activity behaviour and healthy eating intentions. However, as participants were not asked questions directly assessing how much they identified with each group, the claim that participants identified most closely with their friends' group remains an untested assumption.

A second limitation concerns the wording used in Study 2 for the descriptive norm and intention for the healthy eating questions. While the descriptive norm questions asked about the influence of others on "eating healthy", the intention question asked specifically about fruit and vegetable consumption. Fruit and vegetable consumption has been shown to be a good indicator of overall healthy eating (Paquette, 2005), but the lack of correspondence between the descriptive norm and intention measures may have been an issue. In addition, in light of the relaxed alpha value of .10 used in Study 2 interpretation of the results are limited until they can be replicated.

Despite these limitations, this research had a number of strengths that should be highlighted. One of the primary strengths was that it was guided by theory as the hypotheses were informed by the tenets of the theory of normative social behaviour (Rimal & Real, 2005). Another strength was that similar studies were carried out examining two independent but related health behaviours. The fact that the results supported the hypotheses in both physical activity behaviour and healthy eating intentions increases the generalizability of the findings.

A final strength is that these studies considered the possible undetected nature of descriptive norms, something that is new to physical activity and nutrition research. By illustrating how descriptive norms might be associated with individual behaviour and intentions even though they are not reported by individuals as motivating, this research generates questions regarding the validity of asking people about their motivations for activity or healthy eating without actually testing these assumptions.

CHAPTER 3

STUDY 3: USING MESSAGES PROMOTING DESCRIPTIVE NORMS TO INCREASE PHYSICAL ACTIVITY IN UNIVERSITY STUDENTS

In Study 1, a positive relationship was found between participants' perceptions of their friends' activity behaviour (descriptive norms) and participants' physical activity. However, for the purpose of determining whether descriptive norms have a direct causal effect on physical activity, the next logical research step was to conduct an experimental study. To extend the results of the first study, Study 3 aimed to manipulate descriptive norms for physical activity to examine the effect on individual physical activity.

While research has long established that social norms in the form of witnessing others impacts individual behaviour (e.g., Asch, 1952), normative social influence also can occur through messages that are more indirect (e.g., printed messages). Examples of these more indirect forms of normative messages can be found in a variety of behavioural settings (e.g., energy conservation, Nolan et al., 2005; alcohol consumption, Polonec et al., 2006; sunscreen use, Mahler et al., 2008). In general, this literature supports the possibility that messages about the prevalence of others' behaviour (descriptive norm) can result in individual behaviour change. However, the strength of the effects of these normative messages on behaviour varies among studies (Cameron & Campo, 2006; Rimal, 2008).

Theory may provide some answers as to why these interventions vary in effectiveness. As noted in the general introduction, the theory of normative social behaviour (Rimal & Real, 2005) is not the only theory to suggest variables that could influence the relationship between descriptive norms and behaviour. The focus theory of normative conduct (Cialdini et al., 1990), for example, proposes that descriptive norms should motivate change when the behaviour becomes focal in attention. This has been supported by research, which demonstrated that anti-littering norms influenced behaviour when they were made salient by presenting them in clean (i.e., more focal) versus littered environments (Cialdini et al., 1990; Kallgren, Reno, & Cialdini, 2000). As it might be assumed that physical activities that people have the chance to do on a daily basis (e.g., using stairs) would likely be more focal than activities that are encountered less often

(e.g., scuba diving), it is likely that normative messages targeting these more focal activity behaviours would be more effective in changing individual behaviour.

While there is evidence that norms do affect behaviour (Nolan et al., 2005; Polonec et al., 2006, Mahler et al., 2008), little is known about the mechanisms through which this effect occurs (Rimal, 2008; Rimal & Real, 2005). While norms may simply serve as a cue or a decisional short-cut for behaviour (Cialdini et al. 1990), another possible mechanism explaining how norms might affect behaviour is through self-efficacy. In social cognitive theory, Bandura (1977) suggests that self-efficacy, which is a person's beliefs in his or her capabilities, can be increased through four sources (mastery experiences, verbal persuasion, physiological/affective states, and vicarious experience). Descriptive norms, and particularly normative messages, could be targeting two of these sources (verbal persuasion and vicarious experience). The normative message itself could be seen as verbal persuasion while the information about the prevalence of other people performing the behaviour could be providing a vicarious experience. For example, an individual may read a normative message that the majority of students at his or her university are walking or biking to school and think, "If they can do it, I can do it". Rimal et al. (2005) included self-efficacy as an outcome variable in a study of descriptive norms for practicing yoga, and found support for a positive relationship between descriptive norms and self-efficacy. More research is needed to explore efficacy as a potential mechanism through which norms might be affecting behaviour.

3.1 Message Considerations

The main objective of this study was to experimentally test the effects of descriptive norm messages on physical activity while also considering the effects of focal behaviours and self-efficacy. To do this, however, characteristics of effective normative messages needed to be considered. Thus, a secondary objective of this study was to create descriptive norm messages using as many considerations for proper normative messages as possible.

While all normative messages involve conveying that a behaviour is prevalent, it is not as simple as saying, "Everyone else is doing it". In recognition of the importance of creating effective normative messages, Lapinski and Rimal (2005) extended the theory of normative social behaviour to include the role of communication as a variable in the

model. Lapinski and Rimal suggest that there are certain components of normative messages that can make them more or less effective in influencing individual behaviour. For instance, normative messages have been found to be most effective when the behaviour they target is public in nature (Lapinski & Rimal, 2005). Bagozzi, Wong, Abe, and Bergami (2000) found that subjective norm messages about eating with others influenced behavioural intentions more than subjective norm messages about eating alone. Following this reasoning, if one was to create normative messages about the prevalence of biking, a message about the prevalence of people biking to and from work (a public behaviour that would be apparent to co-workers and others) would likely be more effective than a message about biking on a stationary bike at home alone (private behaviour).

Lapinski and Rimal (2005) also identify ambiguity as a behavioural attribute that could influence the relationship between descriptive norms and individual behaviour. These researchers define ambiguity as a situation in which the appropriate course of action is unclear to the actor. It is proposed that in this type of situation individuals are more likely to seek information from those around them (e.g., descriptive norms) in deciding what to do themselves (Lapinski & Rimal, 2005). Going to university has been suggested to be a time when students experience a great deal of ambiguity as they cannot rely on the habitual behaviours from previous years (Lapinki & Rimal, 2005; Rimal, 2008). Literature on college students' alcohol consumption illustrates the possible role ambiguity plays in the relationship between descriptive norms for drinking and individual drinking behaviour (Polonec et al., 2006).

Another concept that is important to consider for normative messages is the concept of believability. When normative messages are found to be believable, it has been suggested that they can have a greater effect on behaviour (Polonec et al., 2006). This would be consistent with the notion that cognitions are strong influencers of behaviour (Ajzen, 1991). Therefore, it is important to consider that an individual's perception of the normative message (believable or not) could impact the effect the message has on the individual's behaviour.

In addition to believability of messages, repetition of messages has been shown to be useful in normative messaging. It has been suggested that repetition, up to a certain

point, can facilitate persuasion (Weiss, 1971). Further, it has been found that this repetition is particularly effective if the messages differ slightly (Harkins & Petty, 1981). For example, when creating normative messages for physical activity, these repetitive but different messages could be about descriptive norms for different activities (e.g., using the stairs, walking, using a fitness facility).

The purpose of this third study was to experimentally test the effect of descriptive norm messages for physical activity on individual physical activity behaviour. A secondary purpose was to explore the effects of two other variables (self-efficacy and focal behaviours).

It was hypothesized that individual activity change would be most associated with a descriptive norm condition, yet this condition would be reported as being the least influential as a motivator of behaviour. This hypothesis was based on the theory of normative social behaviour (i.e., descriptive norms would impact behaviour; Rimal & Real, 2005) and on the suggestions of Pronin, Molouki, and Berger (2007) regarding the underreporting of external influences.

A secondary hypothesis of Study 3 was that post-manipulation self-efficacy would be highest in the descriptive norm condition. This hypothesis was based on Bandura's social cognitive theory (1977), as well as preliminary findings in the normative literature (Rimal et al., 2005).

Last, it was hypothesized that the more focal a behaviour was, the greater the effects of normative influence on that behaviour. Specifically, it was hypothesized that the behaviour of taking the stairs (most focal) would show significantly greater change than the other activity behaviours (using active transportation, using the fitness facility, and walking on breaks). This hypothesis was based on the focus theory of normative conduct (Cialdini et al., 1990).

3.2 Methods

3.2.1 Participants

Participants (N = 211) for this study were university students who were recruited through classroom visits, by posters advertising the study, and through an online announcement on the university website. Participants were sent information about the study through email and completed the online surveys on their own time. All participants

were required to fill out a consent form before participating. Participants had a mean age of 21.6 years (*SD* = 4.2), with 79% of the participants being female (female = 166, male = 45). The mean years at university was 2.6 years (*SD* = 1.7).

3.2.2 Procedures

Ethics approval was obtained for this study from the University Ethics Review Board (see Appendix A). After providing consent, participants were randomly assigned to one of four motivational message conditions (descriptive norm = 51, health = 48, appearance = 54, or information control = 58). These different conditions were based on the results of Study 1 regarding motivations for activity. Before receiving the manipulation, participants were sent an email with a link to an online survey assessing demographics and typical physical activity behaviour (see Appendix D). Participants then received four messages by email, spaced three days apart, with motivation-based information (specific to their condition) encouraging them to be active (see Appendix E). The spacing of the messages (i.e., 3 days apart) was based on a previous study, which followed a similar procedure to deliver normative messages for energy conservation (Nolan et al., 2005).

The messages for this study were modified from normative messages that Nolan et al. (2005) used for research examining energy conservation. All of the messages specifically targeted public and ambiguous activity behaviours. The specific physical activities targeted by the messages were either more or less focal. Using a similar design, these procedures and messages were pilot tested in a sample of office workers in order to ensure the messages were effective (Priebe, Spink, Wilson, & Hobman, 2009). The results from the pilot study revealed that the procedures and materials were effective in eliciting the expected changes.

Participants were sent a total of four messages, each containing a different activity example (i.e., repetitious but different messages). The activities, which varied in their focality, were based on pilot work from Study 1. In Study 1, participants were asked how likely they would be to increase their physical activity behaviour by doing a variety of activities at or on their way to school. The activities that participants reported as being most associated with increased activity (i.e., using the stairs, walking on breaks, using a

fitness facility, and using active transportation) were used in the current study to provide different examples of activities in each of the four messages.

While all participants received the same encouragement and the same four examples of ways to be active, the reasons for being active were manipulated and specific to their condition (e.g., descriptive norm emails promoted being active because others were active, health emails promoted being active for health, appearance promoted being active for appearance, and information control emails simply promoted being active, see Appendix E). Three days after the final information message, participants were directed to a post-manipulation online survey assessing self-reported physical activity change, individual perceptions as to whether the information received was motivational and self-regulatory efficacy for maintenance of physical activity during the forthcoming exam period (see Appendix F). In order to ensure the messages were received and read, a question regarding message receipt was included. In addition, manipulation check questions were used to assess message quality (e.g., message believability, readability). See Figure 3.1 for overview of procedures.

Using written communication of a descriptive norm has been shown to be an effective way of inducing conformity to the communicated norm (Nolan et al., 2005). In addition, it has been found that email is an effective tool in a population that is familiar with the media (Yun & Trumbo, 2006). It could be assumed that university students are frequent users of email as universities send many updates and important school-related notices to students via the university email server. In light of the low cost and ability to reach a wide audience, electronic mail (i.e., email) has been suggested as a useful means of delivery for health-related behavioural interventions (Plotnikoff, McCargar, Wilson, & Loucaides, 2005). For these reasons, online message delivery was deemed to be an acceptable method to utilize in this study.

3.2.3 Measures

Physical Activity. The Godin Leisure-Time Exercise Questionnaire was used to assess both baseline physical activity levels (see Appendix D; section two) and post-manipulation activity levels of participants (see Appendix F; section three). This questionnaire has demonstrated acceptable reliability and validity (Godin & Sheppard,

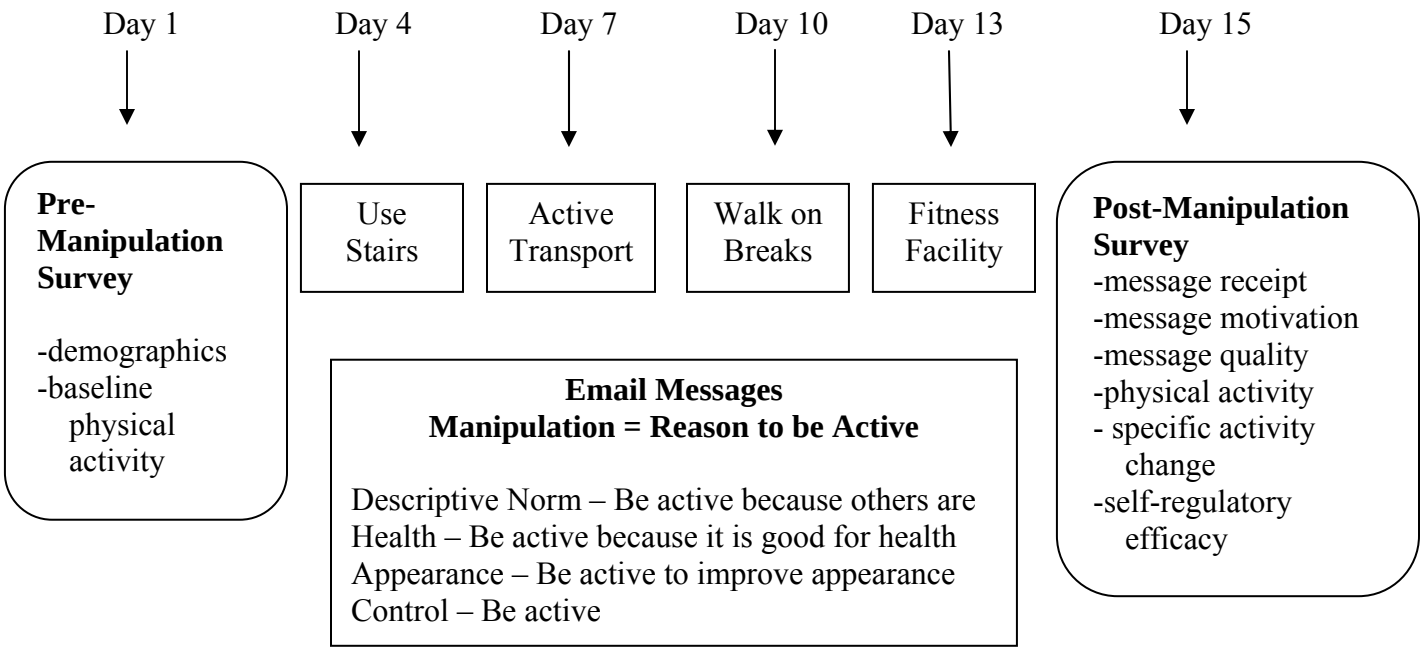

Figure 3.1 Outline of procedures

1985; Jacobs, Ainsworth, Hartman, & Leon, 1993). In agreement with the questionnaire instructions (Godin & Sheppard, 1985), participants were asked about their usual weekly leisure-time physical activity in terms of strenuous, moderate, and light activities. The reported values for these three intensities were multiplied by 9, 5, and 3, respectively to obtain total weekly leisure activity by summing the product of each of the levels of physical activity.

Message Receipt Manipulation Check. To check receipt of messages, in the post-manipulation survey participants were asked, "Do you recall receiving and reading one or more email messages with information on being physically active in the last two weeks?" (see Appendix F; section one). If a "no" response was reported, participants data were deleted.

Motivation. A single item adapted from Nolan et al. (2008) was used in the post-manipulation survey to assess whether or not the participant believed the activity-promoting information they received was motivational (e.g., "How much did the information in the email messages motivate you to be physically active?"). This question was answered on a 7-point Likert scale from 1 = *not at all* to 7 = *very much* (see Appendix F; section two).

Message Quality Manipulation Check. To ensure that the messages were both equivalent and believable to the participants, five message quality manipulation check items were included in the post-manipulation survey (e.g., "The information in the emails about physical activity was aimed at people like yourself"). Responses were made on a 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree* (see Appendix F; section two).

Change in Specific Physical Activities. To assess the change in the four specific physical activities targeted by the information messages, four questions were developed for use in the post-manipulation survey (e.g., "Did your use of the campus fitness facility change in the last two weeks?"). Participants answered either "increased", "decreased", or "stayed the same". If participants responded "increase" or "decrease", they also were asked, "By how much did your use of the campus fitness facility change?" This question was answered on a 7-point Likert scale ranging from 1 = *not at all* to 7 = *very much* (see Appendix F; section four).

Self-Regulatory Efficacy. In the post-manipulation survey, self-regulatory efficacy was assessed through four questions asking participants about their confidence to maintain the physical activity that they had been doing over the last two weeks (study period) during the forthcoming exam period. Participants were asked about their confidence to maintain, prepare in advance, to make it a priority, and to re-arrange their schedule in order to maintain their activity. An example of a self-regulatory item was "How confident are you that you will be able to rearrange your schedule so that you can maintain the activity that you reported doing over the last 2 weeks during the forthcoming exam period?" Participants answered on a 0 to 10 scale with 0 being "not at all confident" and 10 being "completely confident". Responses to the four questins were averaged and this value was used in the subsequent analyses (see Appendix F; section five).

In addition to the above measures, participants answered questions regarding demographic information about their gender, age, college, and years at the university.

3.2.4 Analyses Plan

Prior to the main analysis, data were screened for outliers and variables were checked for normality. Before testing the main hypotheses of Study 3, a one-way, between-groups MANOVA was used to test differences between the four conditions (descriptive norm, health, appearance, or information control; independent variable) on the manipulation check variables ("were the messages… aimed at people like yourself, motivating, believable, easy to read, persuasive?"; dependent variables). In addition, to confirm random assignment to conditions, an ANOVA was used to check differences between conditions on baseline physical activity.

The primary hypothesis of Study 3 was that changes in individual activity levels would be most associated with the descriptive norm condition, yet this condition would be reported as being the least motivational. A planned contrast (Furr & Rosenthal, 2003) was used to test differences between the descriptive norm condition and the other conditions (independent variable) regarding the motivation of messages (dependent variable). To test differences in activity change between the conditions, another planned contrast was used with the dependent variable being the activity change score (post-manipulation physical activity level minus baseline physical activity level) and the independent variable being condition (descriptive norm vs. average of combined other

conditions). An additional analysis was done wherein four similar planned contrasts were run with the dependent variable being change (i.e., frequency x magnitude of change) in each of the four individual physical activity behaviours (i.e., stair use, walking on breaks, active transportation, and campus fitness facility use).

To test the secondary hypothesis regarding self-efficacy, another planned contrast was used to assess differences in post message self-regulatory efficacy levels between the descriptive norm condition and the other conditions.

To test the final hypothesis that the more focal a behaviour, the greater the normative influence, a planned contrast was used. This analysis included only participants in the descriptive norm condition as the hypothesis was about normative influence. Activity change scores between the activity of taking the stairs (predicted to be more focal) was compared to the change in the other activity behaviours (less focal).

3.3 Results

3.3.1 Descriptive Statistics

Prior to the main analyses, data were checked for normality as well as screened for outliers. Data were found to be normally distributed. Of the 226 participants who completed both the pre- and post-manipulation surveys, 9 participants were removed from further analyses as their activity values were found to be outliers based on standardized scores and histograms. Of the remaining participants, 6 participants did not recall reading or receiving the email messages and were removed from the study leaving a final sample of 211.

The participants as a group appeared to be fairly active. The mean baseline activity of the sample (total weekly leisure activity score = 49) was equivalent to an individual participating in roughly five bouts of strenuous or ten bouts of moderate activity (at least 10 minutes long) in a week, which meets the recommendations endorsed in Canada's Physical Activity Guidelines (1998) for achieving health benefits. See Table 3.1 for descriptives.

3.3.2 Preliminary Analyses

Before testing the hypotheses of Study 3, a one-way, between-groups MANOVA was used to test differences between the four conditions on the manipulation check

Table 3.1 Descriptive Statistics for Sample (N = 211)

Variable	Mean (*SD*)
Age (years)	21.62 (4.19)
Years in University	2.57 (1.66)
Baseline Physical Activity [a]	49.39 (25.50)
Post-Manipulation Physical Activity [a]	52.69 (28.86)
Change in Physical Activity [a]	3.30 (24.12)
Motivation of Messages [b]	3.22 (1.54)
Self-Regulatory Efficacy [c]	62.20 (24.65)

[a] Weekly leisure activity score
[b] Scale: 1 *not at all* to 7 *very much*
[c] Scale: 0% *not at all confident* to 100% *completely confident*

variables (e.g., believability of messages, readability). No difference between conditions was found ($p > .10$) (see Table 3.2).

In addition, to confirm random assignment to conditions, an ANOVA was used to test differences between conditions on baseline physical activity. No difference between conditions was found, $F(3, 207) = .39$, $p > .10$, suggesting that assignment was random.

In terms of internal consistency, the self-regulatory efficacy items revealed a Cronbach's (1951) alpha of .92. As this value met the recommended acceptable level of .70 (Nunnally & Bernstein, 1994), this scale was retained in the subsequent analyses.

3.3.3 Main Analyses

The primary hypothesis of Study 3 was that individual activity levels would be most associated with the descriptive norm condition, yet this condition would reported as being the least influential as a motivation for behaviour. A planned contrast revealed no significant difference between the descriptive norm and the other conditions regarding how motivational participants found the messages to be, $t(207) = .72$, $p > .10$. Further, planned contrasts revealed no differences between the descriptive norm condition and the other conditions in overall, strenuous, moderate, or mild physical activity change, $p > .10$. Four similar planned contrasts with the dependent variable being change in the four individual physical activity behaviours (i.e., stair use, walking on breaks, active transportation, and campus fitness facility use) also revealed no differences between conditions, all p's $> .10$.

Of note, however, a within-subjects t-test examining differences in baseline activity ($M = 49.4$, $SD = 25.5$) and post-manipulation activity levels ($M = 52.7$, $SD = 28.9$) across all groups revealed that overall physical activity increased significantly, $t(210) = 1.99$, $p < .05$, effect size = .13.

A planned contrast examining the secondary hypothesis regarding self-efficacy found no difference between the descriptive norm condition ($M = 64.5\%$, $SD = 22.3$) and the combined other conditions ($M = 61.5\%$, $SD = 25.3$) in post-manipulation self-regulatory efficacy levels, $t(206) = -.75$, $p > .10$.

The final hypothesis predicting the more focal a behaviour, the greater the normative influence was supported by the results. A planned contrast revealed that the most focal behaviour resulted in greater behaviour change scores post-manipulation.

Table 3.2 Manipulation Check Variables

Manipulation Checks [a]	Descriptive Norm Mean (SD) n = 51	Health Mean (SD) n = 48	Appearance Mean (SD) n = 53	Control Mean (SD) n = 58
Aimed at you	4.90 (1.54)	4.52 (1.53)	4.66 (1.59)	4.60 (1.73)
Believable	5.59 (1.40)	5.79 (1.11)	5.38 (1.38)	5.67 (1.23)
Easy to read	6.22 (1.00)	5.88 (1.12)	5.74 (1.32)	5.76 (1.34)
Motivating	4.12 (1.40)	3.96 (1.30)	3.91 (1.61)	4.14 (1.33)
Persuasive	4.00 (1.44)	3.94 (1.33)	4.00 (1.45)	4.19 (1.52)

[a] Scale: 1 *strongly disagree* to 7 *strongly agree*

Specifically, the activity of taking the stairs (predicted to be most focal) was found to change (frequency x magnitude of change) significantly more than the other activities, $F(1, 50) = 7.09$, $p < .05$, partial eta squared = .12[1]. In terms of frequency specifically, the number of participants who increased their use of the stairs was greater than the number of participants who increased the other behaviours (see Table 3.3).

3.4 Discussion

The purpose of this study was to experimentally examine the effect of descriptive norm messages on physical activity behaviour. The results revealed that, while physical activity levels increased over the duration of the study, there were no significant differences between the conditions. In regard to the secondary hypotheses, results revealed no significant difference in self-efficacy between the descriptive norm and the other conditions. There were, however, differences between changes in the four specific physical activities, with the most focal activity showing a significantly greater change than the other activities in the descriptive norm condition. This supports the final hypothesis, which was based on the focus theory of normative conduct (Cialdini et al., 1990).

The finding that the descriptive norm condition did not show significantly greater behaviour change in comparison to the other conditions did not support the first hypothesis of this study. One possibility that might explain why norms did not have a stronger effect may simply reflect the fact that the normative information conveyed by the messages was no different than the perception the participants already held about the prevalence of the activities. The basic premise of social norm interventions is that by altering normative judgments about others' behaviour, individual's behaviour will be altered (Campo, Cameron, Brossard, & Frazer, 2004; Rimal, 2008; Schultz, Khazian, &

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[1]Of note, while planned contrasts made the most sense in light of the study hypotheses, examining changes across all four conditions also was done. ANOVAs were run on all of the hypotheses with the independent variables being either the four conditions or the four activities, and the results did not differ (i.e., all ANOVAs were non-significant except for the test of the final hypothesis for focal activities, $F(3, 150) = 3.61$, $p < .05$, partial eta squared = .07).

Table 3.3 Descriptive Statistics for Change in Specific Physical Activities in the Descriptive Norm Condition

Activity	Descriptive Norm Condition n = 51
Using Stairs	35%*
Active Transportation	24%
Fitness Facility	20%
Walking on Breaks	18%

*Percentage represents number of participants who increased the activity behaviour after receiving the manipulation.

Zaleski, 2008). For example, if an individual has a low perception of an activity norm (e.g., thinks most people are inactive), they may feel that they "fit in" by also being inactive. If that individual reads a message that changes their perception (e.g., most people are active 5 days a week), they may feel as if they need to increase their activity behaviour in order to fit in with that norm. If the norms conveyed in the messages used in Study 3 and the participants' pre-message perceptions about the behaviour were similar (e.g., participants already thought 3 out of 4 students used active transportation), then there would have been nothing to alter, and no perception or subsequent behaviour change would be expected.

The findings from Study 1 also may provide some insight into a possible explanation as to why the norm condition did not show the greatest behaviour change. Results from the first study revealed that the norms of the group highest in group identity (friends) were better able to predict individuals' physical activity behaviour than norms of groups of lesser group identity (other students in college and at university). This finding, that group identity contributed to the variance in behaviour explained by descriptive norms, was consistent with both the theory of normative social behaviour (Rimal & Real, 2005) as well as research in other areas. For example, a similar finding was reported in the environmental area where it was found that group norms predicted intention to recycle, but only for those who identified strongly with the group (White, Smith, Terry, Greenslade, & McKimmie, 2009). In terms of friends specifically, the findings of Study 1 also were consistent with normative research on alcohol consumption where norms for a "typical student" were not related to behaviour while norms for "friends" were related (Campo et al., 2003).

The messages used in the current study targeted norms for other students at the university. For practical reasons, it was not possible to target friend norms (it would be unlikely that participants would believe a statement indicating that 3 out of 4 of their friends use active transportation, unless this was indeed the case). In an attempt to make the descriptive norm messages believable to a wide audience, the targeted reference norm group was kept broad (i.e., university students). As such, it is possible that efforts to enhance believability may have comprised the effects associated with group identity resulting in a less persuasive message.

The idea of group identity also may shed some light on the fact that the results of the current study using university students differed from a previous study examining office workers, where messages regarding the prevalence of other employees performing various activities were found to increase mild physical activity behaviour (Priebe et al., 2009). In that study, messages targeted norms for other corporation employees (e.g., "3 out of 4 employees at your company choose to take the stairs instead of the elevator when they have the chance") while in the current study messages targeted norms for university students. In Rimal's (2008) research on normative influence, he found university students reported low group identity with the norm reference group of "other university students". Other research using university student samples has found similar results (Polonec et al., 2006). Given these findings, it also was possible that group identity was low in the current sample of university students. In contrast to a university setting, an office environment would likely be smaller and more self-contained. As such, employees may know or at least recognize most other employees. It could have been that office workers identified more closely with their co-worker group than university students identified with other university students, thus the descriptive norm messages had a greater effect in office workers. However, because group identity was not directly assessed or compared in these studies, at this stage, this suggestion is speculative.

Similar to activity change, self-regulatory efficacy was not significantly higher in the norm condition than the other conditions. While unexpected, this finding was consistent with predictions of social cognitive theory (Bandura, 1977), as behaviour across the conditions would not be expected to change if self-effcicay levels were not different. Why descriptive norm messages did not serve to increase self-efficacy as predicted, however, is unclear.

One possibility that might help to explain why self-efficacy was not higher in the descriptive norm condition also concerns group identity. Perhaps an individual must identity with a group (i.e., group identity must be high) for their self-efficacy to be impacted by norms of that group. Group identity is interpreted by Rimal and Real (2005) in terms of individuals' aspirations to imitate referent others and the extent to which they perceive similarity between themselves and those other people. It is possible that reading about the prevalent activity behaviour of group members that one feels similar to and

aspires to be like could influence self-efficacy through vicarious experience, one of the four sources of self-efficacy identified by Bandura (1977). This speculation is supported by the work of Rimal et al. (2005) who found that perceived similarity, a component of group identity, moderated the relationship between descriptive norms and self-efficacy. If the university students in the current study did not identify with the "university students" group, then it would have been less likely that their self-efficacy would have increased after reading about the majority of individuals in this group being active. In the current study, neither behaviour nor self-efficacy increased significantly more in the norm condition when compared to the other conditions. Therefore, the possibility still exists that norms do impact behaviour by increasing individuals' self-efficacy. More research is needed to explore this possible relationship between descriptive norms and self-efficacy and, if a relationship is established, to examine self-efficacy as a mediator between descriptive norms and behaviour.

While the hypotheses regarding behaviour and self-efficacy were not supported, the hypothesis regarding focal behaviours did receive support. It was assumed that the activity of taking the stairs would be the most focal to participants, as it was something they might have the chance to do immediately after reading the emails. An activity such as using the campus fitness facility, on the other hand, was proposed to be less focal as participants might not necessarily have the chance to do this activity immediately after reading the information. Results revealed that, in the descriptive norm condition, the more focal activity (taking the stairs) showed significantly greater change than all the other activities. This result is consistent with the focus theory of normative conduct (Cialdini et al., 1990), and reinforces the importance of considering the focality of behaviour in normative research. It should be noted, however, that the behaviour of taking the stairs showed the greatest change in all of the conditions, not just in the descriptive norm condition. While further investigation is necessary, this suggests that perhaps the principles of the focus theory of normative conduct could be extended to the use of messages in general (versus to just normative messages). It is also possible, however, that factors other than the focal nature of stair use were at play. For example, as the manipulation took place during the winter season, weather may have influenced the activities that individuals chose to do. Students may have found it easier to increase stair

use, an indoor activity, versus outdoor activities such as use active transportation or walk outside. Of note, however, stair use did increase significantly more than using the fitness facility, another indoor activity.

The current study had a number of strengths. First, the hypotheses were guided by the theory of normative social behaviour (Rimal & Real, 2005) as well as by the focus theory of normative conduct (Cialdini et al., 1990). In addition, an experimental design was used in attempt to build upon the results of Study 1, which was correlational in nature. The need for more theoretically-driven experimental research in the normative area has been advocated by others (Rimal, 2008).

Another strength of the current study was that the conditions (i.e., reasons for activity found to be important to university students) and the activities targeted were based on pilot work done in Study 1. In addition, the materials themselves were piloted in previous physical activity research (Priebe et al., 2009). Of note, participants in the current study rated the believability of the descriptive norm messages to be high (e.g., mean score for believability of messages in descriptive norm condition was 5.6 out of 7). Last, manipulation check questions were included in the post-manipulation survey to ensure that differences between conditions were not due to non-manipulated factors (e.g., message readability).

In addition to strengths, this study also had weaknesses. First, this study may have been improved by including a true control group that received no messages. In the current study no differences were found between the conditions, but all conditions significantly increased overall physical activity. It is possible that these results may simply reflect the Hawthorne effect in that subjects changed their behaviour because they were being studied (McCarney et al., 2007; Roethlisberger & Dickson, 1939). It also is possible, however, that the descriptive norm messages did have an effect on behaviour. While only one condition in the current study received a normative message, all conditions received messages encouraging them to be active. It is possible that receiving a normative message increased physical activity more than not receiving a message at all, but without a no-treatment control group to compare to, this cannot be confirmed. Despite this, however, it could be argued that the design of the current study was strengthened by not using a weak

comparison group (i.e., a no-treatment group, Rovniak, Hovell, Wojcik, Winett, & Martinez-Donate, 2005).

Another weakness may have been that the manipulation check only assessed if participants read "1 or more messages about being active" rather than assessing if participants received all four or not. As repetition is an important component to normative messages (Lapinski & Rimal, 2005), the manipulation may not have been as strong in participants who only read some but not all of the messages. As the manipulation check only assessed if participants read "1 or more" messages, it was possible that some participants read only some of the messages, thus weakening the manipulation.

As mentioned previously, one reason that the descriptive norm messages used in the current study did not influence behavior more than other messages could be that they did not serve to change norm perceptions. In Study 1, descriptive norm perceptions significantly predicted physical activity behaviour. A limitation of the current study could be that norm perceptions were not measured as they have been in other normative research (e.g., Campo et al., 2004) and as they were in Studies 1 and 2. Without a measurement of descriptive norm perceptions, it is unclear as to the whether the descriptive norm messages were effective in changing perceptions but not behaviour, or ineffective in changing neither perceptions nor behaviour.

An additional weakness of this study may have been that the messages were originally developed in another setting (i.e., office workers, Priebe et al., 2009). While testing with office workers provided useful information about the materials, there were important differences between the office worker and student samples (e.g., activity level, group identity) that may have impacted the influence of the normative messages on behaviour. As such, messages may need further work with this student population.

CHAPTER 4
GENERAL DISCUSSION

Despite knowing the health benefits of physical activity and healthy eating behaviours, the majority of Canadians fail to meet the recommendations for being active and eating healthy making the examination of ways to increase these health behaviours important. Though not currently regarded as a strong predictor of behaviour, descriptive norms (an individual's perception about the prevalence of others' behaviour) could potentially play a role in increasing both individual physical activity and healthy eating behaviour. The primary purpose of the current studies was to examine the relationship between descriptive norms and physical activity behaviour. A secondary purpose was to examine the relationship between descriptive norms and healthy eating intentions.

The first two studies examined the possible undetected relationship of descriptive norms to both activity behaviour and healthy eating intentions. Results revealed that perceptions of the behaviour of a group assumed to be high in group identity (i.e., descriptive norms for friends) were more predictive of individual behaviour and intentions than other non-normative factors even though these other non-normative factors were rated by individuals as more motivating.

While these results suggested that descriptive norms could be an important underreported influence on behaviour, results from a follow-up experimental study revealed that descriptive norm messages did not increase physical activity behaviour more than other non-normative messages. Low group identity of the reference group (Rimal, 2008) and lack of change in norm perceptions (Campo et al., 2004) were suggested as possible explanations for this finding.

Despite finding no differences between conditions, physical activity did significantly increase across all conditions. While the possibility exists that changes in activity were simply due to the fact that participants were being studied (i.e., Hawthorne effect, Roethlisberger & Dickson, 1939), it also is possible that the messages did have an effect on behaviour. This is an important finding as the descriptive norm condition increased physical activity to the same extent as the non-normative (e.g., health and appearance) conditions. In addition, more focal activities seemed to strengthen the relationship between the descriptive norm messages and activity behaviour.

4.1 Contributions to the Physical Activity Literature

One of the key contributions to the physical activity literature stemming from this research is the finding regarding the undetected nature of norms. Results from Study 1 revealed that individuals might not always report the most effective strategy, as the reasons that participants reported as highly motivational (i.e., health and appearance) were not the best predictors of individual behaviour. Conversely, descriptive norms were found to be better predictors of being active even though they were rated as less motivational than other reasons.

In a follow up experimental study, while there were no differences between conditions, physical activity increased significantly across all conditions. The fact that descriptive norm messages served to increase physical activity behaviour to the same extent as the other conditions over the course of a two-week study, and the finding that descriptive norms were strong predictors of physical activity in Study 1, contradict the general consensus in the literature that norms are poor predictors of physical activity (Armitage & Connor, 2001; Trost et al., 2002). It should be noted, however, that while the descriptive norm messages in the experimental study affected physical activity to the same extent as messages about being active for health and appearance reasons, there was also no difference in activity change between participants who received the descriptive norm, health, or appearance messages and the control messages. In light of this, targeting a stronger reference group (i.e., higher in group identity) was suggested as a possible way to strengthen the normative messages' effect on physical activity. Nonetheless, the combined findings of these studies provide preliminary evidence that descriptive norms may be more important in predicting physical activity behaviour than previously suspected.

One of the implications of these findings might be that certain individuals may not be motivated by simply knowing physical activity is good for their health or appearance and might need something else to motivate them (i.e., knowing that others are being active). Consequently, it is possible that physical activity researchers and practitioners in the future might need to be more cognizant of descriptive norms in studies designed to impact physical activity behaviour. However, in light of the findings from Study 3, this requires further investigation.

In addition to information about the influence of descriptive norms, other important information can be gleaned from Study 3 to inform future research in the physical activity area. The fact that this brief two-week manipulation significantly increased physical activity levels provided preliminary evidence that internet messages may be an important tool to use for physical activity studies in a university student population. While more research investigating email-based studies is needed (Parrott, Tennant, Olejnik, & Poudevigne, 2008), the results of the current study support a handful of other studies, which have found email to be a promising mode of delivery for physical activity promotion (Dinger, Heesch, Cipriani, & Qualls, 2007; Plotnikoff et al., 2005; Rovniak et al., 2005). Using email to endorse physical activity has practical implications for physical activity promoters, as email is a very cost effective way of delivering material (Yun & Trumbo, 2006).

In addition, Study 3 findings revealed that normative messages highlighting a more focal activity (e.g., taking the stairs) appeared to be more effective than normative messages regarding less focal activities (e.g., using the university fitness facility). If replicated, this has important implications for those wanting to promote physical activity through persuasive messages, as messages that target more focal or immediate activities (e.g., activities individuals could incorporate into their daily lives) seem to be more effective.

4.2 Contributions to the Nutrition Literature

Like descriptive norms for physical activity, it appears as if the effect of descriptive norms for eating also were going undetected. While the finding that the perception of others' healthy eating behaviour appeared to influence individual healthy eating intentions is consistent with a small body of literature (e.g., Herman et al., 2003), it stands in contrast to the general suggestion that norms are not strong influencers of healthy eating (Wood-Baker et al.,2003). While there is a need for experimental research to test the effect of descriptive norms on eating, these findings do highlight the fact that the descriptive norms of groups high in group identity could be more important in increasing healthy eating intentions than previously suspected.

4.3 Contributions to Theory

The fact that the effect of others may have been undetected is consistent with the literature on minority influence (Alvaro & Crano, 1996; Maas & Clark, 1984). In that literature, it is found that although individuals tend to yield to the majority in public, they might not privately accept it. This finding also is consistent with the suggestion of Pronin, Berger, and Molouki (2007) that individuals tend to place greater weight on their own introspective explanations related to their decision to conform to norms rather than on behavioural evidence of their conformity.

In addition to supporting the possibility that the association between descriptive norms and behaviour is undetected, these studies make a number of other important contributions to the norm literature. First, the use of an experimental design in Study 3 is supported by Rimal (2008) who suggested the need for more experimental research regarding the effect of norms on behaviour. Second, an important strength of this research was the differentiation made between descriptive and injunctive norms. As Rimal (2008) stresses, too often researchers in the normative area fail to differentiate between types of norms and instead collapse them into one "norm" variable. As injunctive and descriptive norms can have differing effects on behaviour (Cialdini et al., 1990; Reno, Cialdini, & Kallgren, 1993), important relationships may go undetected when these norms are not examined separately.

Another primary strength of this research was the use of a theoretical underpinning, as the hypotheses considered the tenets of the focus theory of normative conduct (Cialdini et al., 1990), self-efficacy theory (Bandura, 1977), and the theory of normative social behaviour (Rimal and Real, 2005). As the theory of normative social behaviour focuses on very specific phenomena within social influence, it would be described as a limited theory. It has been suggested that the use of a theory such as this would be strengthened by utilizing other complementary theories (Shaw & Costanzo, 1970).

The addition of the focus theory of normative conduct, in particular, proved to be useful as results supported the theory. Also, the findings regarding the focus theory of normative conduct extend the literature using the theory from a primary focus on

environmental conservation (Cialdini et al., 1990; Kallgren et al., 2000; Reno et al., 1993; Schultz, Khazian, & Zaleski, 2008) to the health behaviour of physical activity.

Using the theory of normative social behaviour as a guiding framework also proved to be extremely fruitful as the variable of group identity was able to more strongly predict both activity behaviour in Study 1 and healthy eating intentions in Study 2. This variable also provided a possible explanation as to why the results of Study 3 were not as strong as expected (i.e., group identity may not have been strong enough in the reference group). The emergence of group identity also is consistent with the social identity approach advocated by Terry and Hogg (1996), which suggests that the norms of a relevant group should influence intentions when the individual strongly identifies with that reference group.

4.4 Limitations and Future Directions

One limitation of the present research concerned the fact that the specific information contained in normative message was not evaluated. Study 3 used the message of "3 out of 4 students" (75%) to convey the descriptive norm for the prevalence of an activity behaviour among students. It is possible, though, that a different ratio may have been more effective. Unfortunately, the ratios used in normative messages have varied and offer little guidance as to which might be most effective. For instance, Nolan and colleagues (2005) used ratios ranging from 77-99% while Polonec and colleagues (2006) used "most students" in their normative message manipulations. Rimal (2008) also utilized a variety of ways to communicate a norm (e.g., "7 out of 10", "a typical student", "most students", "many students", "not doing this behaviour is the exception"), but did not compare the effectiveness of these messages. Future research is required to explore how various ratios might affect both the believability of normative messages as well as actual physical activity behaviour change.

Of note, however, featuring believability assumes that cognitive processing is required for norms to be effective (Perkins, 2002). It is worth noting that it also has been suggested that no cognitive processing may be required for norms to work (Cialdini, 2003), which would make the believability debate moot. The examination of this and other possible mechanisms also awaits future research.

Another limitation of this research could be that the normative messages used in Study 3 were not framed properly. For any behaviour, there are many normative judgments that could be made (Cameron & Campo, 2006). In the activity area, normative messages could be cast in terms of days per week of activity, time per session, intensity per session versus the number of individuals who are active, as was done in this study. It is possible that other normative judgments about activity may have resulted in stronger effects. For example, providing participants with a message stating that individuals like them were able to add one additional 10-minute session per day may have been more persuasive as individuals often think of activity in terms of time.

Further, scale correspondences also may have been an issue in the third study. The normative messages for Study 3 were framed with the context of "3 of 4 students" and "times per week" whereas the dependent variable was measured as increases in overall physical activity and change ("increase/decrease/no-change and by how much"), but not times per week, in the specific physical activities targeted in the messages. Cameron and Campo (2006) found that as correspondence increased between the normative message (e.g., message about exercise time per session) and the behaviour (e.g., number of minutes of exercise done per session), the positive relationship between norms and behaviour increased. Both issues of message framing and correspondence require future research.

Another limitation of this research relates to generalizability. In all three studies, the proportion of female participants was much higher than the proportion of male participants. As gender differences in the effect of norms on behaviour have been found elsewhere (Campo et al., 2003; Wood-Baker, Little, & Brownell, 2003), the uneven ratio of females to males may have impacted the results of the studies. The predominantly female samples did not allow for testing of gender differences in these studies, and also limits the generalizability of the findings.

The failure to directly assess group identity was another limitation of this research. While support exists in the literature to support other university students as a low identity norm reference group for students (Rimal, 2008), without assessing group identity, it can still only be speculated that low group identity was a possible reason that the descriptive norm messages did not influence behaviour more than the other messages

in Study 3. Likewise, in Study 1 and 2, group identity also was assumed rather than tested, as empirical evidence was used to make the prediction that friends would be the group highest in group identity (Campo et al., 2003; Polonec et al., 2006). While the findings of this research supported this hypothesis, group identity was not tested directly in these studies, so the effects of a third variable creating the effect are still possible. Further, given that group identity was not directly assessed, this construct could not be tested as a moderator of the relationship between descriptive norms and activity, as suggested by the theory of normative social behaviour. Future research is required to properly test the moderating effects of group identity.

In addition to group identity, the theory of normative social behaviour (Rimal & Real, 2005) suggests other possible moderators (e.g., injunctive norms and outcome expectations) that may influence the descriptive norm-behaviour relationship. The examination of potential moderators is important in truly understanding the relationship between variables (Bauman, Sallis, Dzewaltowski, & Own, 2002). Bauman and colleagues stress the need for more research on moderators particularly as they relate to physical activity behaviour. It is possible that the inclusion of additional moderators in the current studies would have increased the effect that descriptive norms had on behaviour, particularly on physical activity behaviour in Study 3. Thus, an avenue for future research would be to consider moderators such as injunctive norms and outcome expectations as suggested by the theory of normative social behaviour.

Injunctive norms may have been important in the current research, particularly in Study 3 to strengthen the normative messages. Unlike less active individuals, who increased their activity in response to the descriptive norm messaging, high active participants in Study 3 appeared to decrease their activity behaviour in response to the descriptive norm messages. Schultz and colleagues (2007) suggest that this decrease in activity seen in the high active individuals may be countered if an injunctive norm (i.e., what ought to be done) is presented with the descriptive norm. For example, if a person who is already walking to school five times a week reads a normative message indicating, "3 out of 4 students walk to school three times a week", this person may feel as if he or she is going against the norm by being overly active. But, adding an injunctive norm to this message (e.g., "Being physically active is good and the more you do it, the better!")

could counter this negative effect (Schultz et al., 2007). While the messages used in the current study did not directly target an injunctive norm, it has been argued that what is approved of (i.e., injunctive norm) is often what is done (i.e., descriptive norm; Cialdini et al., 1990). In this way, it is possible that participants got a sense of the injunctive norm through the descriptive norm message. This, however, is a possibility that requires future research. Future studies could explore if descriptive norm messages promoting physical activity do, indeed, contain injunctive norms, or if purposefully adding injunctive norms to descriptive norm messages for activity could increase the strength of these messages.

For the inclusion of injunctive norms to have an effect, an injunctive norm that includes social sanctions for physical activity would need to be in place. While there is research regarding injunctive norms for behaviours such as littering (Cialdini et al., 1990) and alcohol consumption (Rimal, 2008), little research exists to support the assumption that individuals believe there are social sanctions if they do not participate in activity. As it has been suggested that people are more likely to conform to a norm if they believe social sanctions are in place for non-compliance (Lapinki & Rimal, 2005), and some researchers have suggested that it is meaningless to talk about norms unless the violation of the norm triggers some form of social sanction (Bendor & Swistak, 2001), exploring the strength of injunctive norms for physical activity is an important avenue for future research.

Outcome expectations, another moderator suggested by the theory of normative social behaviour, stem from Bandura's social cognitive theory (1977). Bandura suggests one of the many factors that can guide human behaviour is outcome expectations (i.e., an individual's belief that his or her actions will lead to benefits). Rimal and Real (2005) propose that if an individual holds positive outcome expectations about a behaviour that others are doing (i.e., a descriptive norm), the individual is more likely to also engage in that behaviour. In this way, outcome expectations about the activities targeted in Study 3 (using the stairs, using the campus fitness facility, walking on breaks, and active transportation) may have impacted the strength of the descriptive norm messages on these activities. For example, a participant may have had positive outcome expectations about going for a walk on their break (e.g., stress relief and getting to spend time outside) and negative outcome expectations about using the campus fitness facility (e.g., paying for

parking and crowded locker rooms). For this participant, the descriptive norm messages about walking on breaks would likely have had a greater impact than messages about using the fitness facility. This possible effect of outcome expectations awaits future research in the activity area.

A fourth moderator, ego-involvement, was added to the theory of normative social behaviour by Lapinski and Rimal (2005) and was later termed behavioural identity by Rimal (2008). Behavioural identity captures the extent to which individuals' self-concept is connected with their position on a particular issue (Lapinski & Boster, 2001), and is suggested to strengthen the relationship between descriptive norms and behaviour for those whose self-identity is aligned with performing a behaviour. Although not testing norms in relation to identity, a study by Strachan and Brawley (2008) provides some evidence that "exerciser" identity and "healthy-eater" identity are linked to individuals' self-efficacy, behaviour, and intentions in each of these respective behaviours. In line with Lapinski and Rimal's suggestions, it is possible that "exerciser" and "healthy-eater" identity also could moderate the relationship between descriptive norms and these behaviours. For example, in Study 3, an individual who identified more with the targeted behaviour (i.e., considered themselves an "active person" or an "exerciser") but whose behaviour fell below the supposed norm in the messages (e.g., didn't use active transportation at least 3 times per week) would likely have been more influenced by the descriptive norm messages promoting exercise behavior than a participant of a similar activity level who did not consider him or herself a physically active person. As this study did not test behavioural identity, this possibility remains speculation and awaits future research.

4.5 Conclusion

The combined results of these studies suggest that descriptive norms, although not necessarily reported as motivating, may be associated with both physical activity behaviour and healthy eating intentions. In addition, group identity with the reference norm group and messages targeting focal behaviours seem to contribute to the relationship between descriptive norms and behaviour. The application of this finding, however, is still unclear as the manipulation of normative messages did not increase physical activity more than non-normative and control messages. As a result, there is a

need for future experimental research in which descriptive norms are manipulated with stronger reference groups and perhaps in less active populations to better test the effect of descriptive norms on this health behaviour.

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Appendix A – Ethics Approval

UNIVERSITY OF SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB)

Certificate of Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	BEH#
Kevan Spink	Kinesiology	08-281

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED
University of Saskatchewan

STUDENT RESEARCHERS
Carly Priebe

SPONSOR

TITLE
Reasons for Physical Activity and Healthy Eating

ORIGINAL REVIEW DATE	APPROVAL ON	APPROVAL OF	EXPIRY DATE
12-Dec-2008	23-Dec-2008	Ethics Application Consent Protocol	22-Dec-2009

Full Board Meeting ☐ Date of Full Board Meeting:

Delegated Review ☒

CERTIFICATION
The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS
In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: *http://www.usask.ca/research/ethics_review*

John Rigby, Chair
University of Saskatchewan
Behavioural Research Ethics Board

Please send all correspondence to

Ethics Office
University of Saskatchewan
Room 302 Kirk Hall 117 Science Place
Saskatoon SK S7N 5C8
Telephone (306) 966-2975 Fax (306) 966-2069

APPENDIX B - Study 1 Reasons for Physical Activity Survey

Section One – Information about You

1. How old are you? _____years

2. Are you: *(please check one)*
____ Male
____ Female

3. What College are you currently registered in? _____

4. Number of years you have been a student at the U of S? _____ years

Section Two - Your Physical Activity

During a **typical 7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 10 minutes** during your free time?
(write on each line the appropriate number)

Times Per Week

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) _____
(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE (NOT EXHAUSTING) _____
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE (MINIMAL EFFORT) _____
(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking)

Section Three – Physical Activity Change

Instructions: Circle the most appropriate answer from 1 = *make little change in current activity level* to 7 = *make lots of change in my current activity level*

1. If you were going to **try to increase your physical activity,** which of these activities do you realistically think you could do to really make a change in your current activity?

a) Taking the **stairs** instead of using the elevator or escalator when I have the chance.

1 2 3 4 5 6 7
Make little change **Make lots of change**

b) Use my free student membership and go to the **PAC** fitness facilities.

1 2 3 4 5 6 7
Make little change **Make lots of change**

c) Going for **walks** on campus when I have a break in between classes.

1 2 3 4 5 6 7
Make little change **Make lots of change**

d) Use **active transportation** (e.g., walking or biking to/from school or park or getting off the bus early and walking some of the way to school).

1 2 3 4 5 6 7
Make little change **Make lots of change**

Section Four - Reasons for Physical Activity

Instructions: *This section asks about the reasons you are or try to be physical activity. Please circle the most appropriate number on the scale.*

1. In deciding to or trying to be active, how important is it to you….

a) that being active improves your health

1 2 3 4 5 6 7
Not at all important **Very important**

b) that being active improves your physical appearance

1	2	3	4	5	6	7
Not at all important						**Very important**

c) that a lot of other students are trying to be active

1	2	3	4	5	6	7
Not at all important						**Very important**

2. Are there any **other reasons** that were not listed that **strongly influence** your physical activity? *(If so, please list)*

_____

Section Five – Others' Physical Activity

1.

a) How often do you think your friends try to be active?

1	2	3	4	5	6	7
Not at all						**Very much**

b) How often do you think other students in your College try to be active?

1	2	3	4	5	6	7
Not at all						**Very much**

c) How often do you think other U of S students try to be active?

1	2	3	4	5	6	7
Not at all						**Very much**

Appendix C – Study 2 Reasons for Healthy Eating Survey

Section One – Information about You

1. How old are you? _____years

2. Are you: *(please check one)*
____ Male
____ Female

3. What College are you currently registered in? _____

4. Number of years you have been a student at the U of S? _____ years

Section Two - Your Eating

INSTRUCTIONS

- **Think about what you usually ate last month.**
- **Please think about all the fruits and vegetables that you ate last month. Include those that were:**
  - **raw and cooked,**
  - **eaten as snacks and as meals,**
  - **eaten at home and away from home (restaurants, friends, take-out),**
  - **eaten alone and mixed with other foods.**
- **Report how many times per month, week, or day you ate each food, and if you ate it, how much you usually had.**
- **If you mark "Never" for a question, follow the "Go to" instruction.**
- **Choose the best answer for each question and check the box above the answer. Mark only one response for each question.**

1. Over the last month, how many times per month, week, or day did you drink **100% juice** such as orange, apple, grape, or grapefruit juice? **Do NOT count** fruit drinks like Kool-Aid, lemonade, Hi-C, cranberry juice drink, Tang, and Twister. Include juice you drank at all mealtimes and between meals.

(Mark a check in the appropriate box)

Never (Go to Question 2)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

1a. Each time you drank **100% juice**, how much did you usually drink?

Less than ¾ cup (less than 6 ounces)	¾ to 1 ¼ cup (6 to 10 ounces)	1 ¼ to 2 cups (10 to 16 ounces)	More than 2 cups (more than 16 ounces)

2. Over the last month, how many times per month, week, or day did you eat **fruit**? Count any kind of fruit – fresh, canned, and frozen. **Do NOT count** juices. Include fruit you ate at all mealtimes and for snacks.

Never (Go to Question 3)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

2a. Each time you ate **fruit**, how much did you usually eat?

Less than 1 medium fruit or Less than ½ cup	1 medium fruit or About ½ cup	2 medium fruits or About 1 cup	More than 2 medium fruits or More than 1 cup

3. Over the last month, how often did you eat **lettuce salad (with or without other vegetables)?**

Never (Go to Question 4)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

3a. Each time you ate **lettuce salad**, how much did you usually eat?

About ½ cup	About 1 cup	About 2 cups	More than 2 cups

4. Over the last month, how often did you eat **French fries** or **fried potatoes**?

Never (Go to Question 5)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

4a. Each time you ate **French fries** or **fried potatoes**, how much did you usually eat?

Small order or less (About 1 cup or less)	Medium order (About 1 ½ cups)	Large order (About 2 cups)	Super Size order or more (About 3 cups or more)

5. Over the last month, how often did you eat **other white potatoes**? Count **baked, boiled,** and **mashed potatoes, potato salad,** and **white potatoes that were not fried.**

Never (Go to Question 6)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

5a. Each time you ate **these potatoes**, how much did you usually eat?

1 small potato or less (About ½ cup or less)	1 medium potato (½ to 1 cup)	Large potato (1 to 1 ½ cups)	2 medium potatoes or more (1 ½ cups or more)

6. Over the last month, how often did you eat **cooked dried beans**? Count **baked beans, bean soup, refried beans, pork and beans** and **other bean dishes.**

Never (Go to Question 7)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

6a. Each time you ate **these beans**, how much did you usually eat?

Less than ½ cup	½ to 1 cup	1 to 1 ½ cups	More than 1 ½ cups

7. Over the last month, how often did you eat **other vegetables**?

DO NOT COUNT:

- Lettuce salads
- White potatoes
- Cooked dried beans
- Vegetables in mixtures, such as in sandwiches, omelets, casseroles, Mexican dishes, stews, stir-fry, soups, etc.
- Rice

COUNT:

- All other vegetables-raw, cooked, canned, and frozen

Never (Go to Question 8)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

7a. Each of these times that you ate **other vegetables**, how much did you usually eat?

Less than ½ cup	½ to 1 cup	1 to 2 cups	More than 2 cups

8. Over the last month, how often did you eat **tomatoe sauce**? Include tomatoe sauce on pasta or macaroni, rice, pizza and other dishes.

Never (Go to Question 9)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

8a. Each time you ate **tomatoe sauce**, how much did you usually eat?

About ¼ cup	About ½ cup	About 1 cup	More than 1 cup

9. Over the last month, how often did you eat **vegetable soup**? Include tomatoe soup, gazpacho, beef with vegetable soup, minestrone soup, and other soups made with vegetables.

Never (Go to Question 10)	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

9a. Each time you ate **vegetable soup**, how much did you usually eat?

Less than 1 cup	1 to 2 cups	2 to 3 cups	More than 3 cups

10. Over the last month, how often did you eat **mixtures that included vegetables**? Count such foods as sandwiches, casseroles, stews, stir-fry, omelets, and tacos.

Never	1-3 times last month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	3 times per day	4 times per day	5 or more times per day

Section Three – Eating Intentions

Instructions: *Circle the most appropriate number on the scale.*

1. On a typical day over the next 2 weeks, I intend to eat the number of servings of fruits and vegetables recommended by Canada's Food Guide (Females = 7-8 servings/day; Males = 8-10 servings/day).

Example of 1 serving: 1 medium sized fruit or vegetable, ½ glass of juice, cup of salad

1 2 3 4 5 6 7
Definitely will not **Definitely will**

Section Four – Reasons for Healthy Eating

Instructions: *Please circle the most appropriate number on the scale.*

1. In deciding to or trying to eat healthy, how important is it to you….

a) that eating healthy improves your health

1	2	3	4	5	6	7
Not at all important						**Very important**

b) that eating healthy improves your physical appearance

1	2	3	4	5	6	7
Not at all important						**Very important**

c) that a lot of other students are trying to eat healthy

1	2	3	4	5	6	7
Not at all important						**Very important**

2. Are there any **other reasons** that **strongly influence** your trying to eat healthy?
(If so, please list)

_____

Section Five – Others' Healthy Eating

1.
a) How often do you think your friends try to eat healthy?

1	2	3	4	5	6	7
Not at all						**Very much**

b) How often do you think other students in your College try to eat healthy?

1	2	3	4	5	6	7
Not at all						**Very much**

c) How often do you think other U of S students try to eat healthy?

1	2	3	4	5	6	7
Not at all						**Very much**

Appendix D – Study 3 Pre-Manipulation Survey

Note: survey adapted from online format.

Section One – Information about You

2. How old are you? (in years)

(255 chars max)

3. Are you female or male?

Female Male

4. What College are you currently registered in?

Select from the dropdown menu:

5. Number of years you have been attending the University of Saskatchewan?

6. [Required] Please indicate your University of Saskatchewan **NSID** (e.g., CSP430). This question is required to match your responses in this survey to a second survey without identifying you. The NSID will be replaced with a numeric key in the data to ensure you cannot be identified.

(255 chars max)

Section Two – Your Physical Activity

During a typical 7-Day period (a week), how many times on the average do you do the following kinds of exercise for more than 10 minutes during your free time?

7. STRENUOUS EXERCISE (HEART BEATS RAPIDLY)
(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

Select the appropriate times per week from the dropdown menu

8. MODERATE EXERCISE (NOT EXHAUSTING)
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

Select the appropriate times per week from the dropdown menu

9. MILD EXERCISE (MINIMAL EFFORT)
(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking)

Select the appropriate times per week from the dropdown menu

Appendix E – Study 3 Messages

Descriptive Norm Condition:
Note: the descriptive norm condition receives four email messages with different activities each time.

Active Transportation Email:
" Join Other U of S Students in Being Physically Active. We're halfway through this term and most students at the U of S are finding ways to be active when they are not in class. How are U of S students like you being physically active? By using active transportation (e.g., walking to and from school, parking further away, or getting off the bus early and walking some of the way to school)! In a recent survey, **3 out of 4 U of S students** reported walking at least some of the way to school three or more times per week. Using Active Transportation - Your Student's Popular Choice!"

Use the PAC Email:
"Join Other U of S Students in Being Physically Active. We're halfway through this term and most students at the U of S are finding ways to be active when they are not in class. How are U of S students like you being physically active? By making use of their free student memberships at the PAC. The facility includes cardio and weight training equipment, a climbing wall, a pool, a walk/jog track, and racquetball courts! Records show most U of S students have used the PAC once and **over 75% of students** use it at least one time per week. Using the PAC - Your Student's Popular Choice!"

Take the Stairs Email:
" Join Other U of S Students in Being Physically Active. We're halfway through this term and most students at the U of S are finding ways to be active when they are not in class. How are U of S students like you being physically active? By taking the stairs instead of using the elevator or escalator! Studies have shown that **3 out of 4 college-aged men and women, like those at the U of S**, choose to use the stairs instead of the elevator. Taking the Stairs Instead of the Elevator or Escalator - Your Student's Popular Choice!"

Walking Email:
"Join Other U of S Students in Being Physically Active. We're halfway through this term and most students at the U of S are finding ways to be active when they are not in class. How are U of S students like you being physically active? By going for a walks on campus in between classes! A recent poll of **U of S students** found that roughly **three quarters** walk during their breaks in between classes at least two times per week as a way of incorporating physical activity into their day. Walking on Campus - Your Student's Popular Choice!"

Information-Only (Control):

Active Transportation Email:
"Be Physically Active. We're halfway through this term and the time is right for you to

be physically active. How can you be physically active this month? By using active transportation (e.g., walking to and from school, parking further away, or getting off the bus early and walking some of the way to school)! Active transportation is an excellent way to increase the amount of physical activity that you do. The time is right to be more physically active by using active transportation (e.g., walking to and from school or parking or getting off the bus early and walking some of the way to school)!"

Use the PAC Email:
"Be Physically Active. We're halfway through this term and the time is right for you to be physically active. How can you be physically active this month? By making use of your free student membership at the PAC. The facility includes cardio and weight training equipment, a climbing wall, a pool, a walk/jog track, racquetball courts, and more! As you can see there are a variety of options. Using the PAC exercise facilities is an excellent way to increase the amount of physical activity that you do. The time is right to be more physically active by using your free student membership at the PAC!"

Take the Stairs Email:
"Be Physically Active. We're halfway through this term and the time is right for you to be physically active. How can you be physically active this month? By taking the stairs instead of using the elevator or escalator when you have the chance! Using the stairs instead of an elevator or escalator, when you have the chance to, is an excellent way to increase the amount of physical activity that you do. The time is right to be more physically active by using the stairs instead of the elevator or escalator when you have the chance!"

Walking Email:
"Be Physically Active. We're halfway through this term and the time is right for you to be physically active. How can you be physically active this month? By going for a walk on campus when you have breaks between classes! Walking during the breaks you have between classes is an excellent way to increase the amount of physical activity that you do. The campus was well-designed for walking and there are lots of excellent walking paths that criss-cross the campus. The time is right to be more physically active by walking on campus during the breaks you have between classes!"

Health Condition:

Active Transportation Email:
"Improve Your Health by Being Physically Active. We're halfway through this term and the time is right for improving your health by being active. How can you improve your health? By using active transportation (e.g., walking to and from school, parking further away, or getting off the bus early and walking some of the way to school)! As you can see, there are many options that you have available to you when you start thinking about active transportation choices. Regular aerobic activity, such as the walking involved in active transportation, has been found to lower your risk of chronic disease. Using Active Transportation – The Healthy Choice!"

Use the PAC Email:
"Improve Your Health by Being Physically Active. We're halfway through this term and the time is right for improving your health by being active. How can you improve your health? By making use of your free student membership at the PAC fitness facility. The facility includes cardio and weight training equipment, a climbing wall, a pool, a walk/jog track, racquetball courts, and more! Regular physical activity (e.g., regularly using the fitness facilities at the PAC) can improve your health and reduce your risk of developing several chronic diseases such as diabetes and heart disease. Using the PAC – The Healthy Choice!"

Take the Stairs Email:
"Improve Your Health by Being Physically Active. We're halfway through this term and the time is right for improving your health by being active. How can you improve your health? By taking the stairs instead of using the elevator or escalator when you have the chance! Taking the stairs instead of the elevator or escalator is one way to improve your health by increasing your physical activity. Studies have found a significantly lower risk of chronic diseases in participants who climbed more than 55 flights per week. Taking the Stairs Instead of the Elevator or Escalator – The Healthy Choice!"

Walking Email:
"Improve Your Health by Being Physically Active. We're halfway through this term and the time is right for improving your health by being active. How can you improve your health? By going for a walk on campus when you have a break between classes! A recent study found that walking at least 2 hours per week was associated with health benefits such as a reduction in chronic disease risk. Walking on your breaks between classes could add up to 2 hours of walking throughout the week and therefore could help improve your health. Walking on Campus– The Healthy Choice!"

Appearance Condition:

Active Transportation Email:
"Improve Your Appearance by Being Physically Active. We're halfway through this term and the time is right for improving your appearance and physique by being active. How can you improve your appearance? By using active transportation (e.g., walking to and from school, parking further away, or getting off the bus early and walking some of the way to school)! As you can see, there are many options that you have available to you when you start thinking about active transportation choices. Research has shown that those who are physically active are more satisfied with their physical appearance. Using Active Transportation - To Look Your Best!"

Use the PAC Email:
" Improve Your Appearance by Being Physically Active. We're halfway through this term and the time is right for improving your appearance and physique by being active. How can you improve your appearance? By making use of your free student membership at the PAC. The facility includes cardio and weight training equipment, a climbing wall, a pool, a walk/jog track, racquetball courts, and more! Routine physical activity (e.g.,

regularly using the fitness facilities available at the PAC) has been shown to improve body composition (e.g., through reduced abdominal adiposity, gains in muscularity, and improved weight control). Using the PAC - To Look Your Best!"

Take the Stairs Email:
"Improve Your Appearance by Being Physically Active. We're halfway through this term and the time is right for improving your appearance and physique by being active. How can you improve your appearance? By taking the stairs instead of using the elevator or escalator when you have the chance! Research shows that climbing just two flights of stairs everyday could result a loss of 2.7kg per year. If you do the math, six flights of stairs a day could help you trim nearly 8.2kg a year. Taking the Stairs Instead of the Elevator or Escalator - To Look Your Best!"

Walking Email:
"Improve Your Appearance by Being Physically Active. We're halfway through this term and the time is right for improving your appearance and physique by being active. How can you improve your appearance? By going for a walk on campus when you have a break in between classes! Research with university students shows that those who walk regularly are more satisfied with the way they look. You can look your best by walking on campus during the breaks that you have between classes. Walking on Campus During the Breaks you have Between Classes- To Look Your Best!"

Appendix F – Study 3 Post-Manipulation Survey

Note: survey adapted from online format

Section One – Matching Information

1. [Required] Please indicate your University of Saskatchewan **NSID** (e.g., CSP430). This question is required to match your responses in this survey to the first survey without identifying you. The NSID will be replaced with a numeric key in the data to ensure you cannot be identified.

(255 chars max)

2. [Required] Do you recall receiving and reading one or more email messages with information on being physically active in the last two weeks?

- Yes
- No

Section Two – Manipulation Check Questions

Please recall the email messages about physical activity that you received over the past 2 weeks when answering the following questions.

3. How much did the information in the email messages motivate you to be physically active?

1	2	3	4	5	6	7
Not at all						**Very much**

4. The information in the emails about physical activity was *aimed at people like yourself*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

5. The information in the emails about physical activity was *believable*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

6. The emails about physical activity were *easy to read*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

7. The information in the emails about physical activity was *motivating*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

8. The information in the emails about physical activity was *persuasive*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

Section Three – Your Physical Activity

During the last 7-Day period (last week), how many times did you do the following kinds of exercise for more than 10 minutes during your free time?

9. **STRENUOUS EXERCISE (HEART BEATS RAPIDLY)**
(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)
Choose the appropriate response from the drop down menu

10. **MODERATE EXERCISE (NOT EXHAUSTING)**
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)
Choose the appropriate response from the drop down menu

11. **MILD EXERCISE (MINIMAL EFFORT)**
(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking)
Choose the appropriate response from the drop down menu

Section Four – Change in Specific Activities

12. Tell us about your use of active transportation in the last two weeks?
Recall active transportation is the use of human-powered movement (e.g., walking to and from school, parking further away, or getting off the bus early and walking some of the way to school).

☐ Decrease ☐ No Change ☐ Increase

13. By how much did your use of active transportation change?

1	2	3	4	5	6	7
Not at all						**Very much**

14. Tell us about your use of stairs in the last two weeks?

☐ Decrease ☐ No Change ☐ Increase

15. By how much did your use of stairs change?

1	2	3	4	5	6	7
Not at all						**Very much**

16. Tell us about your use of the PAC exercise facility in the last two weeks?

☐ Decrease ☐ No Change ☐ Increase

17. By how much did your use of the PAC exercise facility change?

1	2	3	4	5	6	7
Not at all						**Very much**

18. Tell us about your walking on breaks in between classes in the last two weeks?

☐ Decrease ☐ No Change ☐ Increase

19. By how much did your walking on breaks behaviour change?

1	2	3	4	5	6	7
Not at all						**Very much**

Section Five – Confidence for Physical Activity

To answer the following questions use this scale:
0% = not at all confident to 100% = completely confident

35. How confident are you that you will be able to maintain the activity that you reported doing in the last 2 weeks during the forthcoming exam period?

☐ 0% ☐ 10% ☐ 20% ☐ 30% ☐ 40% ☐ 50% ☐ 60% ☐ 70% ☐ 80% ☐ 90% ☐ 100%

36. How confident are you that you will be able to prepare in advance so that nothing interferes with you maintaining the activity that you reported doing over the last 2 weeks during the forthcoming exam period?

☐ 0% ☐ 10% ☐ 20% ☐ 30% ☐ 40% ☐ 50% ☐ 60% ☐ 70% ☐ 80% ☐ 90% ☐ 100%

37. How confident are you that you will be able to make it a priority to maintain the activity that you reported doing in the last 2 weeks during the forthcoming exam period?

☐ 0% ☐ 10% ☐ 20% ☐ 30% ☐ 40% ☐ 50% ☐ 60% ☐ 70% ☐ 80% ☐ 90% ☐ 100%

38. How confident are you that you will be able to rearrange your schedule so that you can maintain the activity that you reported doing over the last 2 weeks during the forthcoming exam period?

☐ 0% ☐ 10% ☐ 20% ☐ 30% ☐ 40% ☐ 50% ☐ 60% ☐ 70% ☐ 80% ☐ 90% ☐ 100%